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Self Help.

Undoubtedly the best help in the world is self-help, and it is really of self-help that Mr. Tecumseh Swift, with the cooperation of Mr. Sargent, tells us in the present issue. We get a little idea from their work of what a few individual American workmen in one small town of Vermont, with wages averaging certainly not higher than in many other places, have done for themselves in the way of securing permanent, attractive and more than comfortable homes.

It is not easy to suggest how the owners of these homes could have made a wiser or a better use of their savings and of their spare time. Life for them, while these homes have been growing to them, has been something more than a mere purposeless prolongation of existence. They have had continually something to work for, something, in the confident hope of its realization, well worth working for, and this no doubt has quickened and stimulated them as wage-earners in the shop. They have continually, we may believe, both in the shop and out of it, been helped and strengthened in their work by the determination to make the best rather than the worst of everything, and in that attitude they have been playing the game of life winningly. This kind of thing is good for the individual, good for the family down through the unborn, good for the community and good for the nation. In it is one of the "secrets" of American success which our foreign friends most need to consider, for it is not to be understood that the few workmen's homes here shown are unique or exceptional, only that they may have been more fortunate than many in picturesqueness of situation and in some local details of opportunity. American workmen in many places in every State of the Union are in the habit of acquiring homes of their own.

Many of course do not, and vast numbers undoubtedly have little to show for their earnings beyond the fact that they still are breathing. Some do no better simply because they do not know any better, and they would do better if they saw the way and could be inspired with any hope of success in it. In showing what some have done and are doing for themselves there is help for the rest. Both the brightest side and the very darkest side of the workman's life are well worth showing each to the other, and either view must carry its lesson to all.

The New German Tariff Bill.

The long-threatened new German Tariff Bill has at last been published and it justifies all the fears of those who have been predicting retaliation on the part of that country against us. In view of the nature of the German classification it is not easy to determine what the various increases are, but on machinery the duties appear to be doubled, and perhaps more than doubled. This action, following so closely on that of Russia, is especially significant.

The new tariff is not yet an accomplished fact, as it must run the gauntlet of the Reichstag where modifications are likely to be made, though it would appear that they are as likely to be additions as reductions. There is a powerful, or at any rate a noisy, opposition to the new tariff in Germany who regard it as against the interests of the country. This opposition could, it would seem, hardly choose a better time for the experiment to be tried if it must be tried at all. German industries are at present going through a period of depression when any unfavorable result will be especially marked. So far as American exporters of machinery are concerned, the time is also, in a negative sense, favorable. Owing to the business depression in Germany our exports of machinery to that country have already fallen to a low figure and hence at the moment the increased tariff can do us little harm. Should its results prove unfavorable to Germany, as we believe they will, it is quite possible that this action will be soon reversed and that the doors will be opened again by the time there is any trade to be carried on through them.

The Bridge Gives Warning.

Brooklyn Bridge, one of the great engineering works of the world, and perhaps of all existing strutures in the position of greatest responsibility, has just called attention to itself in a manner demanding immediate and serious consideration. The bridge was designed and constructed by competent and conscientious engineers, and when they left it complete it commanded a confidence commensurate with the pride and admiration of the community. The completion of the bridge, however, left for the engineer another and continuous duty in the proper maintenance of it in as nearly as possible its original efficiency and safety. As to how this latter duty has been fulfilled we do not purpose to say a word. We may, however, state what seem to be the facts as to how the details of maintenance have been attended to, and they can be left to speak for themselves.

The bridge was designed for a definite service, or for the carrying of a carefully computed load, and it no doubt was amply strong for the work required of it. In the nature of things, however, the bridge could never be stronger than at first, but necessarily was, by undiscoverable and unpreventable corrosion if by no other causes, somewhat weaker every day from the date of its opening. One most obvious duty of the engineers who had anything to say about it was to insist that the original safe load must not be increased. The necessities of a rapidly increasing traffic could not properly be made to override the original factor of safety. The bridge was designed for the use of pedestrians, for vehicles of all kinds as drawn by horses in the streets of the city, and for trains of cars drawn by cable. For this, of course, the bridge was safe. Competent engineers have been found to declare the bridge equally safe for many additions to the load as at first contemplated. Besides running the original bridge cars by cable the trains of the Brooklyn elevated roads have been crowded upon it as closely as it has been possible to run them with all the devices that could be thought of for rapidly loading and unloading the trains. Double lines of rails have been laid for each track with a third rail for the elec-

tric conductor. The bridge carries eight cables where two were at first contemplated. The use of the electric traction instead of the cable allows the trains to gain upon each other and to come close together if any one is delayed, as they could not with the cable. Innumerable electric wires for various service have been stretched across the bridge and two lines of heavy pipes for the penumatic postal service. Then tracks were laid on each roadway for surface cars, with the necessary overhead wires and supporters. At first a limited number of cars were run, but later the number was limited to what could be crowded together end for end upon the whole span of the bridge. A protest against this practice was made a couple of years ago, not by the bridge engineers, but by the bridge itself, in the buckling of one or two of the trusses. These were repaired and then the rule was made that the cars must be kept 200 feet apart. The rule posted at the ends of the bridge require the cars to be spaced one hundred and *two* feet apart, a very peculiar order for the average motorman, or for anybody else, the idea apparently being that the man might be sure of the two feet if not of the hundred, and in fact the cars have frequently found themselves very close together.

Things have been going along quite smoothly of late, but only a few days ago the bridge gave what must be considered a very serious warning in the snapping of twelve contiguous suspension rods. It is not necessary to call attention to the alarming nature of such an "accident" as this. When one suspension rod breaks those on each side of it must support the load of the broken one in addition to their own. When several adjoining ones break all of their load is transferred to those beyond, so that under the best of circumstances if a sufficient number break the rest must also go, and it is easy to imagine the roadway and load of the bridge being torn from it as a seam is ripped when it begins to let go.

The most serious fact in connection with the recent "accident" to the bridge is that it was not discovered by the engineers or by anyone connected with the care of the structure, but passing teamsters and lolling policemen. It appears from the reported statements of those in charge that there has been no systematic inspection of the bridge. Some workmen have been employed around it, and it has been assumed that they would certainly see if anything was wrong. It appears further that the bridge has not been painted in four years.

As we said, we have not a word to offer as to the competence and faithfulness of the engineers who have been and who are responsible for the safe maintenance of the bridge. The bridge, however, may have something to say for itself. We are not disposed to be alarmists, but the recent warning given by the bridge cannot be taken too seriously.

Horseshoe Machinery.

Horseshoe machinery is a difficult article to obtain in the open market in America since its manufacture is completely, or almost completely, under control of the horseshoe manufacturing interests. Twice recently we have been asked by exporters where such machinery could be found. One of these subsequently told us that after making a determined chase he had been unable to run down any such machines and did not believe that there were any available. In this connection may be noted a late improvement on machines for casting iron or steel horseshoes by James Vernon, which is mentioned in "La Metallurgie." In the ordinary form of metallic mold for this purpose there is a fixed rear or bottom portion and a movable front portion or cover, the cores to form the holes being set in obliquely across. The mold has the inconvenience that the rapid contraction of the casting renders it hard to withdraw. In the improved form of mold the front and back portions are both movable, there being an intermediate fixed section which surrounds the horseshoe exteriorly and supports it when these are removed, this being done when the casting is sufficiently formed and no inconvenience is experienced from the contraction of the metal.

Prize for Protective Foundry Foot-Gear.

The Association of Manufacturers of France Against Accidents of Work announces a public international competition for a prize of 1,000 francs ($200) to be awarded for the invention of a protector to guard the feet and lower part of the legs of foundry workmen against burns from flying pieces of molten metal. Besides effectively accomplishing this object, such device should be easily and quickly removable. It should adapt itself to the requirements of local regions and customs and to different sorts of footgear or should itself constitute a complete footgear. It should be light and should not inconvenience the workman in his movements. It should be cheap and sufficiently strong.

The competitors should send to the President of the Association, 3, rue de Lutèce, Paris, France, prior to December 31, 1901, a description of the device and two pairs of each form of the protectors, for use in practical tests. These will belong to the Association. The inventors should take sufficiently early steps to protect their ownership of the invention, but the Association reserves the right to publish the designs submitted as it sees fit. The prize may be awarded entirely to one competitor or divided among several. For all information the office of the society may be addressed as above.

The price of platinum is said to be higher now than ever before, being $36 an ounce.

Shop Treatment of Burns.

To treat large or deep burns the aid of a physician is required. It is necessary to avoid resort to ink which is often used to relieve the pain. Besides tannate of iron, the constituent of ink which has sometimes occasioned its recommendation, there are often poisonous coloring matters, the absorption of which by the skin may lead to grave results. The following is a series of recipes which may be found useful:

1. Cocaine pomatum. On the burned region is applied the following:

Hydrochlorate of cocaine	1	gramme
Aristol (biniodic thermol)	4	"
Olive oil	20	"
Lanoline	75	"

Repeat the applications every two hours until the pain is suppressed.

2. Oleo-calcic-carbonate liniment:

Hydrated quicklime (slaked lime)	100	grammes
Powdered sugar	200	"
Glycerine	200	"
Water	1000	"

Add to 100 grammes of the above mixture 200 grammes of arachic acid and agitate them in a large-mouthed flask. Thus you obtain a liniment having considerable consistency which can advantageously be used for dressing burns of which it hastens and regularizes healing.

3. Another liniment:

Slaked lime	20	grammes
Powdered sugar	40	"
Distilled water	20	"
Glycerine	40	"

Mix. Leaves of cotton wadding are moistened with the mixture and applied upon the regions of the burns.

4. Another liniment:

Lime water	50	grammes
Linseed oil	50	"

Mix while agitating. A compress saturated with this mixture is applied to the burn. This is covered over with other cold compresses, and if need be with a rubber bag of ice.

5. New remedy.* This is a remedy which advantageously replaces the old formulas. It is employed at the Hospital St. Louis. When anyone is burned from whatever cause, immediately apply compresses kept constantly moistened with the following solution:

Picric acid	10	grammes
Water	1,000	"

The pain will gradually become less acute and the slough which may form will be driven off.

A saturated solution of chlorate of potash may be substituted for the above in case of necessity, but the results are often less satisfactory.

The yellow stains of picric acid may be removed with carbonate of lithia.—Translated from the "Chronique Industrielle."

*Substantially the same, however, was described in the "American Machinist" of September 20, 1897, page 739, which see for fuller explanation.

Stratification.

Attainment of an ideal social condition demands that this industrial, working world should not become stratified but rather be in liquid condition, the human atoms freely moving. Stratification means stagnation and worse. It stifles, and represses and withholds from merit its proper reward, for stratification among human beings begins, as it does in the case of the earth's crust, at the top. Its effect is to keep in a lower stratum men who ought to be at the top. Youth and ambition and merit are at eternal war with this idea, and ought to be. Our Republic was and is a protest against the historic and old-world order, in which a single family absorbs the governing functions of a whole people and a few others absorb and retain all the chief and choice places of honor and profit. Now, it is perfectly clear that to you, starting on your careers, it is of the highest importance that in the upward way there should be no artificial barriers erected by class or caste, or combination of capital or of labor keeping the builders of the barriers in and you out of any place or pursuit you may desire to fill or follow, and that you are capable of filling or following better than those who, having gotten in, have sought to shut the door against all others and hold by prescription what they obtained perhaps by right, but never would have obtained if the restraints they seek to enforce on others had been enforced on them. Demand your rights, but concede to others theirs, remembering that your rights end where the others' begin. Play the game of life fairly. Never forget that it's a race, not a fight, with a place for every competitor, and that when each is in his place, his fitting place, the place for which he is best fitted, the highest harmony and the best results are obtained for the collective whole.—W. C. BALL, to students of Rose Polytechnic Institute.

Commercial Review.

NEW YORK, Monday, July 29.

MACHINERY MARKET OBSERVATIONS.

In the last two weeks some attention has been called in the "Commercial" and "Manufacturers" departments of this paper to the activity in new enterprises or extensions in the line of car shops. Further important instances of this and allied character may be adduced. It is clear that we have entered a period of notable expansion in the locomotive building facilities of the country.

The announcement has been made since our last report went to press that the American Locomotive Company has decided to increase the capacity of its Schenectady plant from 425 to 1,000 locomotives a year. The idea is to make this its central plant, although the others also will be enlarged and improved. To start the work $500,000 has been appropriated. The most improved machinery will unquestionably be installed, and when the equipment is completed the company will be able to turn out 2,000 locomotives annually. The company has orders enough on hand to keep its works running at full capacity for a year. The claims of the home market are so vociferous that it is shipping few engines abroad, although the foreign demand is heavy also. The officials of the company are quoted as stating that the reason the Baldwin Locomotive Works have not been taken into the combine is that they insist upon having their present high profits guaranteed for all time.

This, however, the Baldwin people strenuously deny and say that their works are not for sale. For the last twenty years the Baldwin works have averaged one-third of the output of the country. Last year they built 1,217 locomotives out of 3,153. (It is doubtful to what extent this estimate takes account of locomotives privately built in railroad shops.) The addition which the firm will make to its works along Sixteenth and Spring Garden streets will increase the capacity to thirty locomotives a week, or to about 1,500 a year. The structure will be six stories in hight, and will extend from Sixteenth street, east of Spring Garden, a distance of 315 feet, meeting the present structure. There will be a wing on Sixteenth street, extending back toward Buttonwood a distance of 208 feet. The ground floor of the new shop will be used to expand the cylinder department, and the upper floors for machine shops. In readjusting space the intention has been to remove the noisier processes from those locations where they will be specially objectionable to near-by residents.

Excavation has been begun for the construction of the plant of the Hicks Locomotive & Car Works at Chicago Heights, Ill. The buildings to be erected at present will be six in number, while other buildings will be added as the demands increase. The main building will have a frontage of 810 feet, the machine shop will be 100x350 feet; erecting shop, 170x750 feet; foundry, 100x350 feet; office, 30x70 feet, and there will be a large building for storage purposes. The plant will be equipped with all modern appliances, such as traveling cranes, air hoists, pneumatic tools and transfer tables. The company says it will start work with a large number of orders already contracted from several prominent Western roads. They expect to employ a force of 350 men.

Another possible project in the railroad shop line is at Kansas City. The Missouri Pacific has just bought 89 acres of land there and will, it is rumored, erect central car shops for its system. There being also a rumor that the purchase was merely to secure yardage, more definite information must be awaited.

The Bureau of Supplies and Accounts, Navy Department, opened bids, July 23, for quite a lot of machinery to go to various navy yards. There were several good sized machines figured on. The following are some of the bidders who made the lowest figures: Niles Tool Works Company, one vertical milling machine for Portsmouth, $1,845; one 8-foot vertical boring and turning mill for League Island, $3,300; one 20-inch back-geared engine lathe, for League Island, $615. Spencer Automatic Screw Machine Co., one No. 2 double turret automatic screw machine with tools, for Boston, $1,671.50. Bement, Miles & Co., one double frame 2,000 pound steam hammer for Portsmouth, $1,824; one plate rolling machine for Boston, $4,200; one plate planing machine for Boston, $2,175. S. A. Woods Machine Company, one improved jointing and facing machine for buzz planer, for Portsmouth, $197.50. McKay Engineering Company, six 10 horse-power 110-volt direct current low-speed multipolar electric motors, shunt wound for 150 revolutions per minute, for Portsmouth, $2,700. (There were eight bids on the last-mentioned lot, the highest being $4,734.) New Jersey Engineering Company, one double cylinder double friction drum-hoisting engine complete with boiler, for Norfolk, $549. Western Electric Co., two 15, five 10 and three 5 horse-power motors with a starter for each of them, for Norfolk, $2,149.50. Among other machinery bid on was an open-side planer for League Island, on which $4,000 was the lowest figure named, a horizontal boring, drilling and milling machine for League Island, bid down to $1,750, and a 3-inch forging, upsetting and heading machine for Portsmouth, $2,940.

A large quantity of the machinery that has been built in this country for the Sydney, Australia, tramways was shipped last week. These shipments were estimated to amount, all told, to 800 tons. They included some 450 tons of machinery from the General Electric Company and one of the engines built by the E. P. Allis Company. This was a 32x64x60-inch vertical cross-compound engine, which took thirteen cars to carry it from the West. The other two similar engines are expected to be shipped in September and October. A 9x16½x12-inch Harrisburg standard tandem compound engine, some Worthington pumping and condensing apparatus and a quantity of piping supplied by the Crane Company, of Chicago, were shipped on the same vessel.

FOREIGN TRADE NOTES.

A draft of the proposed new German customs law has just been made public. The following duties are sought to be levied on machinery, etc.: Steam boilers, from 5 to 8 marks per 100 kilos; locomotives, from 9 to 11 marks per 100 kilos; steam engines, 3½ marks per 100 kilos; sewing machines, 35 marks per 100 kilos; machinery for wood, iron and stone working, from 20 marks on machines weighing 2½ hundred-

weight to 4 marks on machines weighing 10 tons; steam threshers and mowers, 9 marks per 100 kilos; miscellaneous machinery, from 3 marks 50 pfennigs to 18 marks per 100 kilos; dynamos and motors, from 9 marks per 100 kilos on machines weighing 5 hundredweight or less to 6 marks on dynamos and motors weighing from 5 to 30 hundredweight; telephone and telegraph apparatus, 60 marks per 100 kilos.

The "Zeitschrift fuer Werkzeugmaschinen und Werkzeuge" throws out a scintilla of encouragement regarding the German industrial situation. While loud complaint of business stagnation is still heard in iron and machinery market circles, yet the machinery and machine tool builders are a little better employed than they were. Promises of the early year are in part fulfilled. Generally, however, buyers are still holding back. The shipyards on the North Sea and Baltic are buried with work for almost the remainder of the year, and the construction of river boats has also looked up somewhat. Locomotive works have an abundance to do.

It would seem, therefore, that American manufacturers of pneumatic tools and similar specialties that have the call in ship yards and locomotive plants should have a good market still in Germany. Quite a number of new warships were recently ordered by the government from native builders, and until the principles of the Hague conference are accorded a much more whole-hearted acceptance than they are to-day it seems to us that those of our manufacturers who cater to the shipyard trade will have a chance for German business if any foreigner will.

The German Agrarians are availing themselves of the success of American competition to belittle Germany's foreign trade. On behalf of the manufacturing party a retort is made calling attention to the relatively small hold of the United States upon the trade of her nearby American neighbors, considering how well situated she is to control a monopoly of it. Europe gets about half the export trade with Canada, Mexico and a part of Central America. In South America, where we have no advantage of proximity, we are a smaller commercial factor. Our share of exports to the Argentine in 1899 was only $15,400,000 out of $116,800,000, while we sent only $3,000,000 worth out of $38,700,000 worth of goods that went to Chile. In Uruguay and Paraguay our export trade is insignificant; in Brazil it ranges from the first to the sixth place, and in Peru and Bolivia is far behind that of Great Britain or Germany. Statistics like these make cheerful reading for Americans, since they show what large fields are open to us when a depression at home induces us to give them some attention. It might be wiser, however, to follow up the Pan-American Exposition with a Southern business campaign without waiting for the depression to come. Remember, Germany makes it no secret that she has her commercial, not to say her political, eye cocked at South America.

The Turkish Government has extended for another ten years the exemption from import duty on numerous classes of agricultural implements provisionally allowed in 1882.

The value of the import trade of machinery into Norway, according to a late consular report to the German Government amounted in 1900 to 7,488,200 crowns against 10,716,700 crowns in 1899, 9,025,300 in 1898 and 7,625,500 in 1897. The falling off is attributed to the general business condition of the country. The proportions imported from different countries have not yet appeared, but in 1899 the United States had the fourth place with 965,800 crowns to her credit, while Germany came first with 4,236,500 crowns, England second with 3,076,700 crowns and Sweden only a little ahead of us with 1,194,800 crowns. The creditably good showing made by America has been largely brought about by the trade in machine tools. The prominent share of Germany was due to the supply of machinery for a variety of industries, such as paper manufactories, grist mills, breweries, brickyards, mineral water factories and shoe factories; also electrical machinery. Only the smaller electrical machines are produced at home, while for the supply of the larger Germans claim the preference, though in single instances they are built in Sweden. Of textile machinery which formerly came preferably from England, Germany finds an increasing sale.

CHICAGO MACHINERY MARKET.

For boilers and engines July trade has been almost if not quite as satisfactory as that of June. It remains the common complaint of salesmen that much business is lost because suitable deliveries cannot be arranged. The activity is for all kinds of power requirements. It is one of the peculiarities of the machinery business in the West that for no apparent cause there are at times prolonged delays in getting pending business closed while at other times orders are bestowed with a rush that overwhelms. In this careening sort of way the volume of trade is all that can be desired. And the good part of it is that while business actually sealed and delivered during July has been large the amount that is yet in sight does not seem to have decreased. The largest builder of engines in the West declined, on account of the late strike, to figure on much business during July, but with shops running fully last week and progress made on delayed orders closer attention can from now on be paid to new inquiries. The same experience is reported by other engine builders, whose shop activities have not been seriously interrupted by strikes. They have been compelled to pass by much desirable business in silence simply because they could not get out the work when wanted. At Denver, Salt Lake City and other Western cities there has been an excellent demand for blowing and other engines in connection with large orders for mining machinery.

The Erie City Iron Works report July business considerably better than that of June. Sales of boilers exceeded those of engines, perhaps because of the shorter life of the former, for much of the current trade is the refurnishing of power for old plants. But there is an excellent demand for power for new plants also. Among the orders taken by this company during the past few days were two for engines of 1,000 horse-power each, one of which was for a manufacturing plant in the Middle West and the other for a power and light plant.

Alex. Van Sicien & Co. say the midsummer business is of a character that permits of no complaint. Among orders recently taken was one for three engines of 100 horse-power each, one of them direct connected, for a plant at Hammond, Ind.

A. L. Ide & Sons have sold two 250 horse-power tandem compound direct connected engines for General Electric alternators of 150-kilowatts each, for the shops of the Santa Fé road at Albuquerque, N. Mex., also one small engine for driving exciters.

Quotations.

NEW YORK, Monday, 29.

Pennsylvania Foundry Pig Irons, Jersey City delivery, good brands:

No. 1 X	$15 15 @ $15 50
No. 2 X	14 65 @ 15 15
No. 2 plain	14 15 @ 14 65
Gray forge	13 75 @ 14 25

Alabama Pig, New York delivery:

No. 1 foundry, or soft	14 75 @ 15 00
No. 2 foundry, or soft	14 00 @ 14 25
No. 3 foundry	13 50 @ 13 75
Foundry forge, or No. 4	13 00 @ 13 25

Bar Iron—Base sizes—Refined brands, mill prices on dock, 1.58c.; from store, nominally 1.85 @ 1.90c.

Tool Steel—Base sizes—Good standard quality, 7c.; extra grades, 10c. and upward.

Machinery Steel—Base sizes—From store, 1.90 @ 2.00c.

Cold Rolled Steel Shafting—Base sizes—From store, 2½ @ 2¾c.

Copper—Lake Superior ingot, irregular, being quoted from 16½ or 16⅝ to 17c.; electrolytic, 16⅜ @ 16⅝c.; casting, 16¼ @ 16⅝c.

Pig Tin—28c. spot cash for 5 and 10-ton lots, f. o. b.

Pig Lead—For wholesale lots, 4⅜c., with .02½ @ .05c. extra for carloads.

Spelter—3.95 @ 4.00c., New York.

Antimony—Cookson's, 10¼ @ 10⅜c.; Hallett's, 8¾c.; U. S., 8½ @ 8¾c.; Hungarian, 8½ or 8⅝c.

Lard Oil—Prime City, 68 @ 69c. for jobbing lots as a fair average.

Modern Guns at the Pan-American Exposition.

BY GRAHAME H. POWELL.

The ordnance exhibit of the War Department at the Pan-American Exposition contains much that is of more than passing interest not only to engineers but to the layman as well, as this is the first time the guns used in the coast defenses of the United States have been freely exhibited to the public.

The exhibit includes one of each type of gun installed in our coast fortifications and upon which dependence is placed to resist invasion by a possible hostile power.

The largest gun shown is the 12-inch breech-loading rifle, mounted on a service disappearing carriage. This gun weighs 115,000 pounds and is 51 feet in length, with a maximum diameter at the breech of 44½ inches, tapering to 21 inches at the muzzle. Fig. 1 shows the construction of the gun, which is of the built-up variety and consists of a tube, jacket and eight hoops, including the one carrying the trunnions, all of forged steel shrunk together.

Two forms of projectiles are used in this gun, shot and shell, each of forged steel; the former being 3½ feet in length and the latter 4 feet. The shell is designed to carry an explosive bursting charge. The form of these projectiles is shown in Fig. 2; each weighs 1,000 pounds. With a muzzle velocity of 2,330 feet a second, using smokeless powder, the calculated penetration of one of these projectiles is 28½ inches in ordinary steel at 1,000 yards, falling to 23½ inches at 3,500 yards, or two miles. With the service charge of 240 pounds of smokeless powder the maximum pressure at the moment of discharge is 37,000 pounds per square inch.

The carriage upon which this gun is mounted is the joint invention of the present head of the United States Ordnance Department, Gen. A. R. Buffington, and Capt. Wm. Crozier of the same corps.

More than ordinary interest attaches to this particular design, as it represents a type which is largely in use in this country, though the policy of mounting guns on disappearing carriages to the practical exclusion of the non-disappearing type has been seriously questioned by many artillery officers.

Fig. 3 is a side view of the gun and carriage. Two parallel levers are mounted on a horizontal axis which is journaled in a movable top-carriage. The gun is mounted on the upper end of the levers and a counterweight is attached to the lower ends. The top-carriage carries two oil cylinders, and the ends of the piston rods sliding therein are attached to upright brackets at the rear of the main frame or chassis. Constant resistance in the cylinders is obtained by the passage of the liquid from front to rear through varying orifices caused by throttling bars whose inner faces are curved. There are two throttling bars in each cylinder passing through slots in the piston. The sectional area of these bars is such that the orifices for the flow of the liquid vary with the position of the piston during recoil, so as to obtain the desired resistance. A small portion of the energy of the recoil is taken up by raising the counterweight, but the greater portion by the resistance which the fluid offers to being driven through the orifices.

During recoil the top-carriage slides to the rear on the slightly inclined chassis rails and the counterweight rises, while the trunnions of the gun describe portions of ellipses in passing to the loading position. The counterweight is held in the raised position by pawls pivoted to the chassis rails and engaging in racks on the sides of the counterweight, which is thus prevented from returning to the firing position until the pawls are released. The gun is, of course, sufficiently over-counterweighted to cause it to rise into "battery" or firing position upon being released.

The carriage revolves upon a circle of twenty-four forged-steel conical rollers securely held in place by two concentric distance rings resting upon a lower roller path. The system is held concentric by flanges on the inner ends of the rollers.

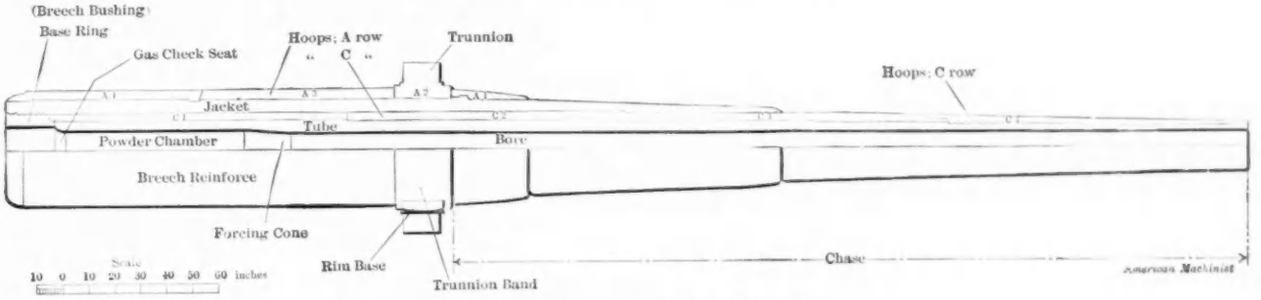


FIG. 1. 12-INCH BREECH-LOADING RIFLE.

The carriage is traversed in azimuth [horizontal plane] by means of crank handles attached to a horizontal shaft which actuates a train of spur gearing engaging a forged steel traversing rack attached to the inside of the base ring.

The gun is elevated and depressed by means of hand-wheels which actuate through a train of worm and spur gearing the elevating arms which are attached to the base of the gun at the upper ends, the lower ends working in guides bolted to the inner faces of the chassis rails. Chains are provided for hauling the gun by hand from the firing to the loading position. These chains wind on drums placed between the cheeks of the carriage.

The counterweight of this carriage

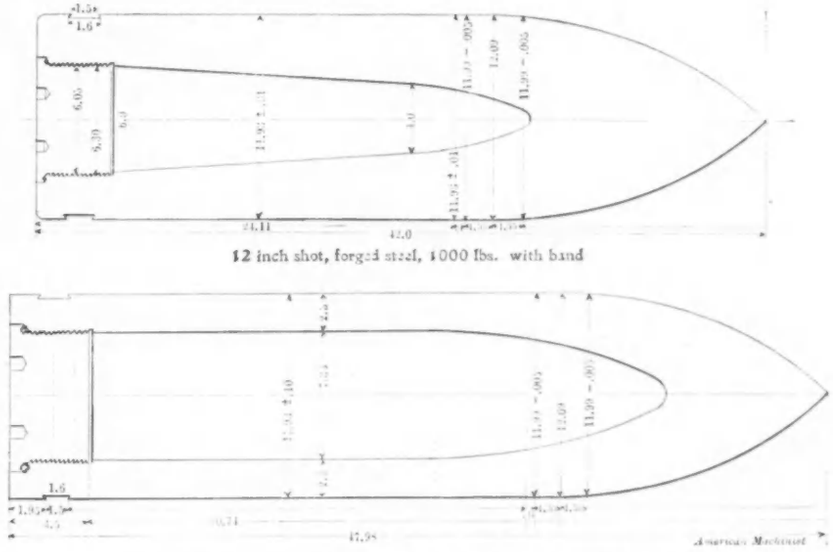


FIG. 2. 12-INCH ARMOR-PIERCING SHELL, STEEL, 1,000 POUNDS.

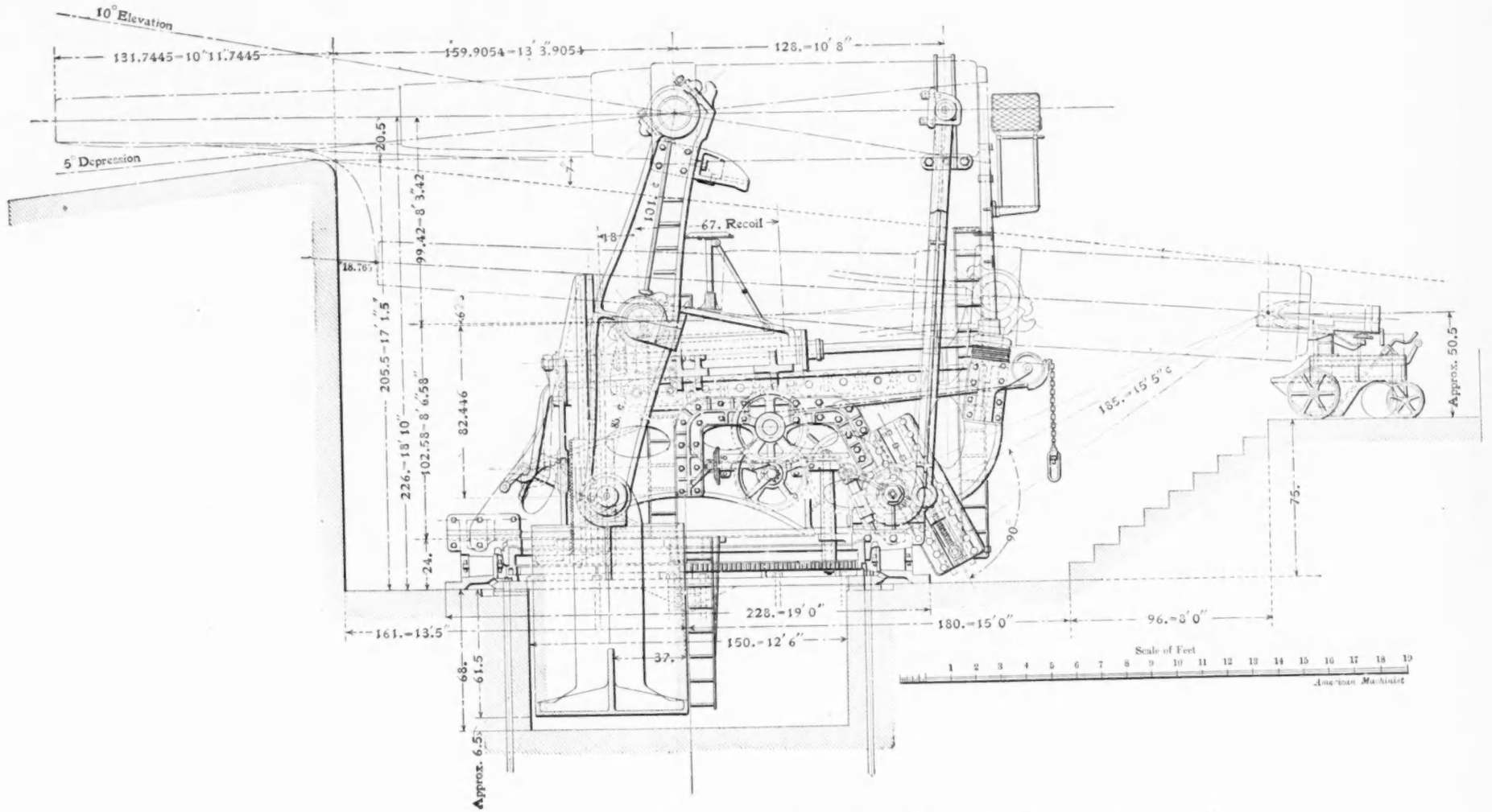


FIG. 3. UNITED STATES DISAPPEARING CARRIAGE FOR 12-INCH BREECH-LOADING RIFLE.

weighs 157,000 pounds, the total weight of gun and carriage being, approximately, 475,000 pounds.

Next in the exhibit is a 10-inch rifle on non-disappearing barbette carriage. This gun weighs 66,700 pounds, has a total length of 30¾ feet, a maximum diameter at breech of 35 inches and 17½ inches at muzzle.

The projectiles, which are similar in design to those already described, weigh 575 pounds; the charge is 140 pounds of smokeless powder, with a maximum pressure of 37,000 pounds per square inch. With a muzzle velocity of 2,300 foot-seconds, penetration in steel at 1,000 yards is 23 inches.

In general appearance the barbette carriage resembles the disappearing, but with it the gun is constantly in sight above the parapet. The gun is trunnioned directly to the top-carriage, and there is no counterweight, the recoil being absorbed entirely through the medium of the oil cylinders.

The gun is elevated through a rack bolted to a band on the gun. A pinion mounted on a short cross-shaft engages in

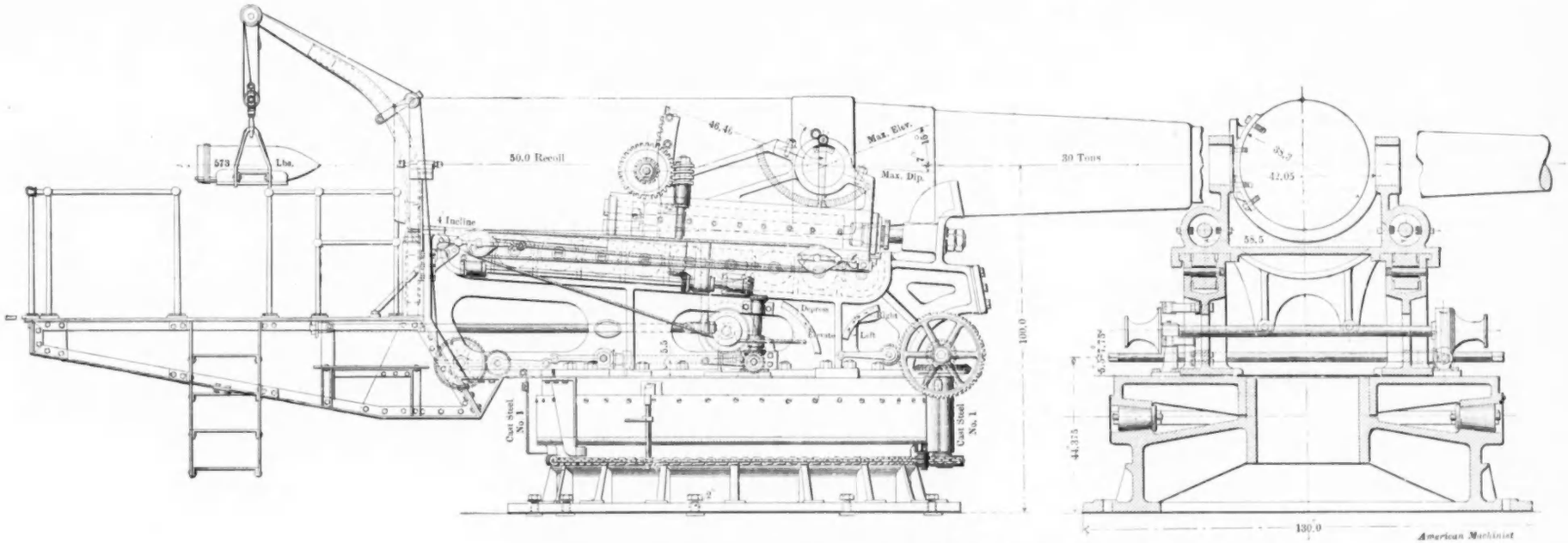


FIG. 4. BARBETTE CARRIAGE FOR 10-INCH BREECH-LOADING RIFLE.

this rack. This shaft is connected by bevel gears to the main elevating shaft, upon which are placed hand-wheels. This carriage has a loading platform upon which the gunners stand and which moves with the carriage. The gun returns to the firing position by gravity, the chassis rails being inclined about 4 degrees. Fig. 4 gives a side view of this gun and mount.

In contrast to the direct fire guns already described, mortars are used for indirect fire—that is, at angles varying from 45 degrees to 75 degrees elevation. The construction of the 12-inch steel mortar on exhibition is shown in Fig. 5, and consists of tube, jacket and six hoops, all of forged steel and shrunk together. They are 13 feet in length and weigh 29,120 pounds. Projectiles are either what are termed semi-armor piercing (deck-piercers) or torpedo, and are of two sizes, 800 and 1,000 pounds weight. The charge is 50 pounds smokeless powder; penetration at 1,000 yards, 10.7 inches steel.

This mortar is mounted on a spring return carriage. Fig. 6, the general design, is that of a center pintle carriage with base ring, a live-roller traversing circle between upper and lower roller paths, and two side frames or cheek pieces resting upon a racer, sustaining hydraulic cylinders for controlling the recoil, and spring return cylinders to lift the mortar into battery. These cheek pieces are united by a heavy transom. The mortar is sustained by two independent trunnion carriages sliding at an angle of 50 degrees upon rails projecting from the sides or cheek pieces.

A hollow cylinder is cast in each side of the frame and in these are placed the column of springs. A slot in the side of the cylinders permits the entrance of brackets from the trunnion carriages, against which the upper ends of the recoil springs abut.

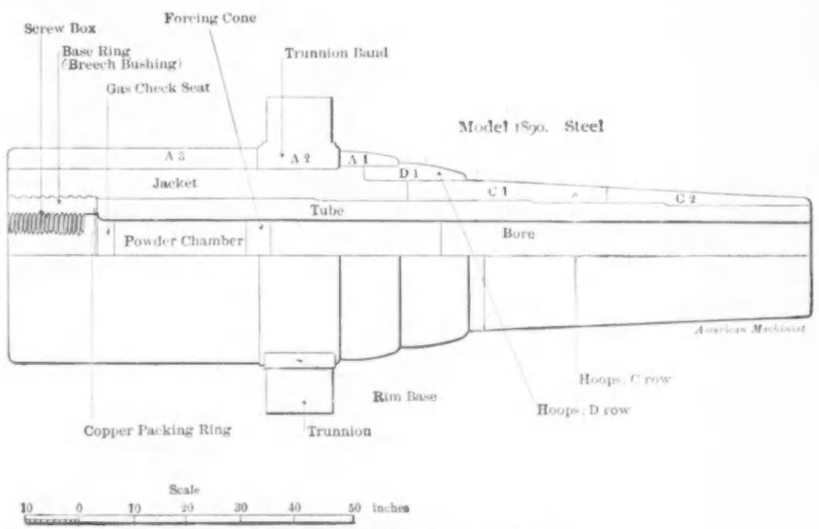


FIG. 5. 12-INCH STEEL MORTAR.

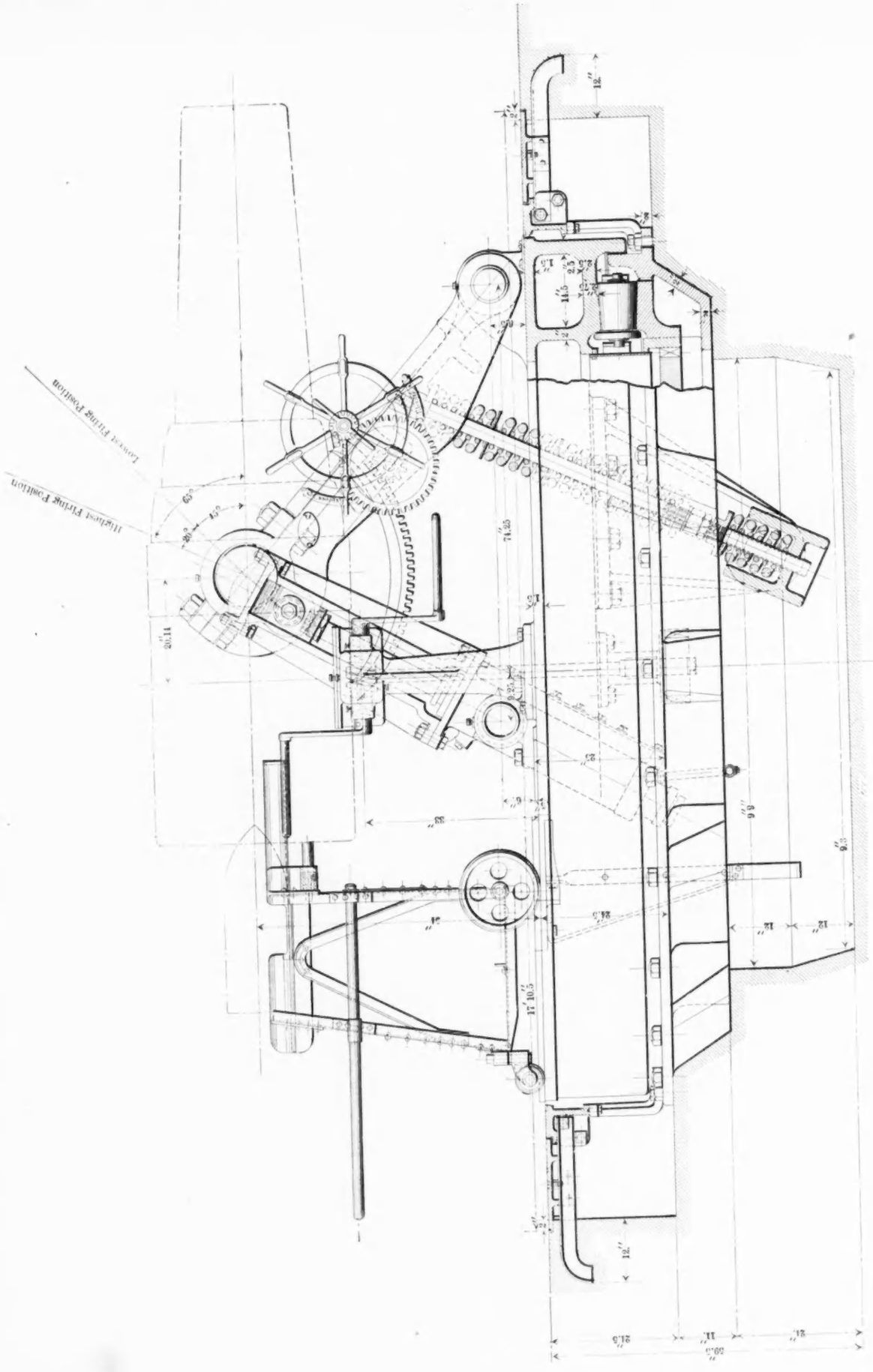


FIG. 6. UNITED STATES CARRIAGE FOR 12-INCH BREECH-LOADING MORTARS.

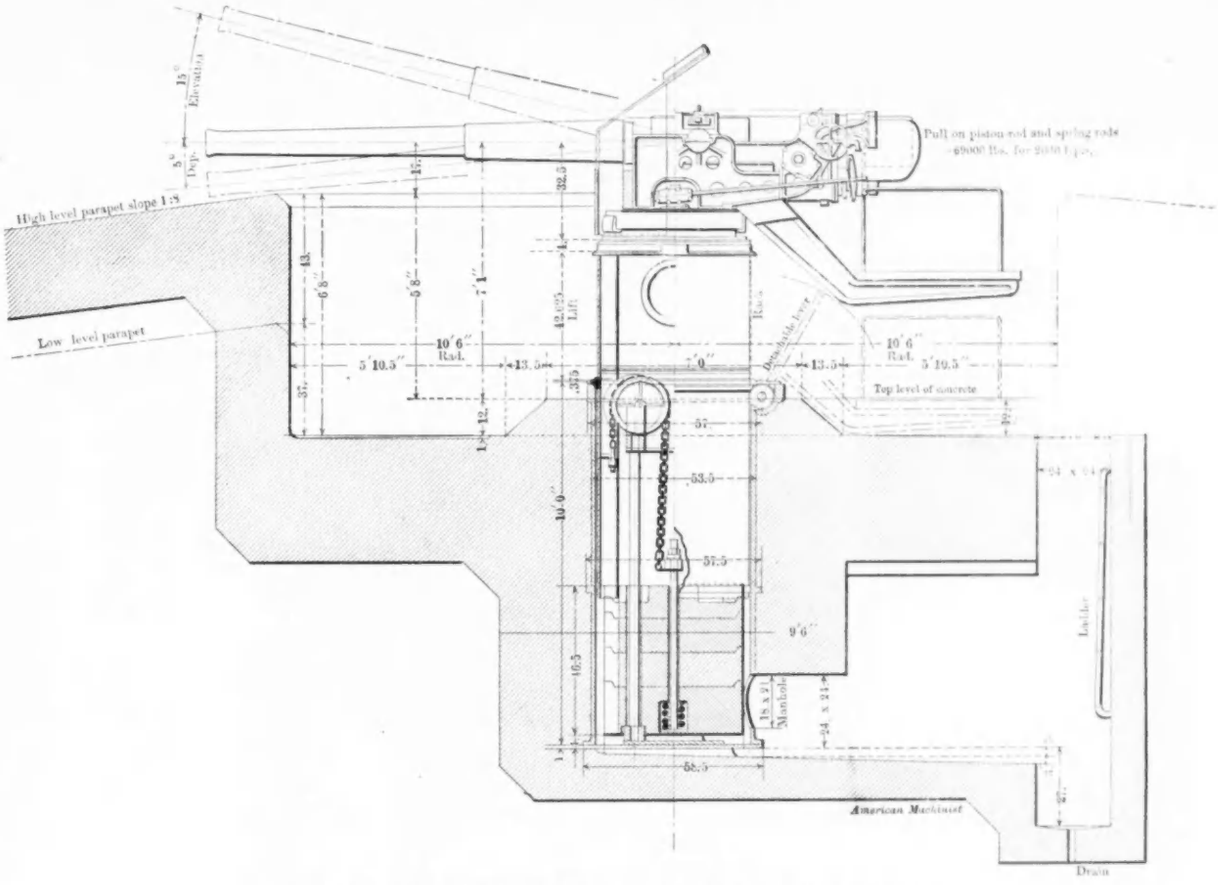


FIG. 7. BALANCED PILLAR MOUNT FOR 5-INCH RAPID-FIRE GUNS.

The column of springs in each cylinder is composed of two concentric coils wrapped in opposite directions, divided into short sections with a separator plate placed at the top and bottom of each section. Ten sections of coiled springs, supplemented by eight and a half pairs of Belleville springs, are required in each cylinder.

The mortar rests in the trunnion carriages, and under each trunnion is a hydraulic cylinder of 7¾ inches interior diameter for checking the recoil. The lower ends of the two cylinders are connected by an equalizing pipe.

The elevation is given by means of two independent, bronze, internally geared segments, each secured at one end to a bracket which is attached to the mortar and at the other end to a band shrunk upon the mortar in front of the "A" hoops. Mortars are mounted in groups of four, four pits constituting a standard battery.

The remaining gun of this portion of the exhibit is of an entirely different type from those already described. This is a 5-inch rapid-fire gun and is capable of a fire of from eight to ten shots a minute. The projectile weighs 55 pounds and the powder charge is 16 to 18 pounds of smokeless powder.

The carriage is of the balanced pillar type. By means of a counterweight the gun is raised to a firing position, and so remains during firing. When not in use, the gun is lowered and remains hidden from the enemy's view behind the parapet. The gun is not trunnioned, as are the larger calibers, but recoils in a cradle, being provided with feathers, top and bottom, sliding in keyways cut in the cradle. The underside of the cradle carries a recoil cylinder and two chambers for the counter recoil springs. The piston rod is attached to a recoil band of forged steel shrunk and keyed to the gun.

The counter recoil springs on each spring rod are composed of helical springs divided into three sections by two bronze separators. Each section is composed of two coils.

In recoiling the gun moves to the rear in the cradle about 12½ inches, carrying with it the piston and spring rods and compressing the recoil springs. The greater portion of the energy of recoil is, however, taken up by the resistance of the oil cylinders, which are similar in construction to those on the 12-inch rifle.

The pillar which is used to raise or lower the gun is made of ½-inch steel plate. It is in halves, riveted together and strengthened by three pairs of longitudinal angle-irons placed in the interior. A rack on the side of the pillar meshes with a pinion at the top end of the cylinder. The cylinder in which the pillar rises and falls is made of cast iron. The counterweight, weighing 22,000 pounds, is composed of two cast-iron and two lead sections. The parts of the counterweight are assembled on a suspension rod connected to three chains passing over pulleys whose axles are free to roll on forks secured to the top of posts in the bottom of the cylinder. The counterweight is designed to balance the weight of the rising parts.

The mount carries with it a loading platform. The cannoneer standing on this platform operates the traversing handwheel with his right hand and the elevating wheel with the left hand. Through the medium of the gearing, one man is thus enabled to readily aim the gun and keep it constantly trained on the target. The gun is provided with electrical firing apparatus and night sights. The total weight of the carriage and counterweight is 48,800 pounds. Fig. 7 is an elevation of the gun and mount.

The remainder of the ordnance exhibit is interesting from a historical point of view, but contains little in the way of modern coast defense weapons.

The ease with which one may nowadays have his picture printed in the daily newspapers is illustrated by the performance of a Philadelphia newspaper which publishes the picture of a boy merely because he claims to have had revealed to him in a dream the lost art of hardening copper. This method of hardening copper is a favorable subject for dreams both by day and by night.

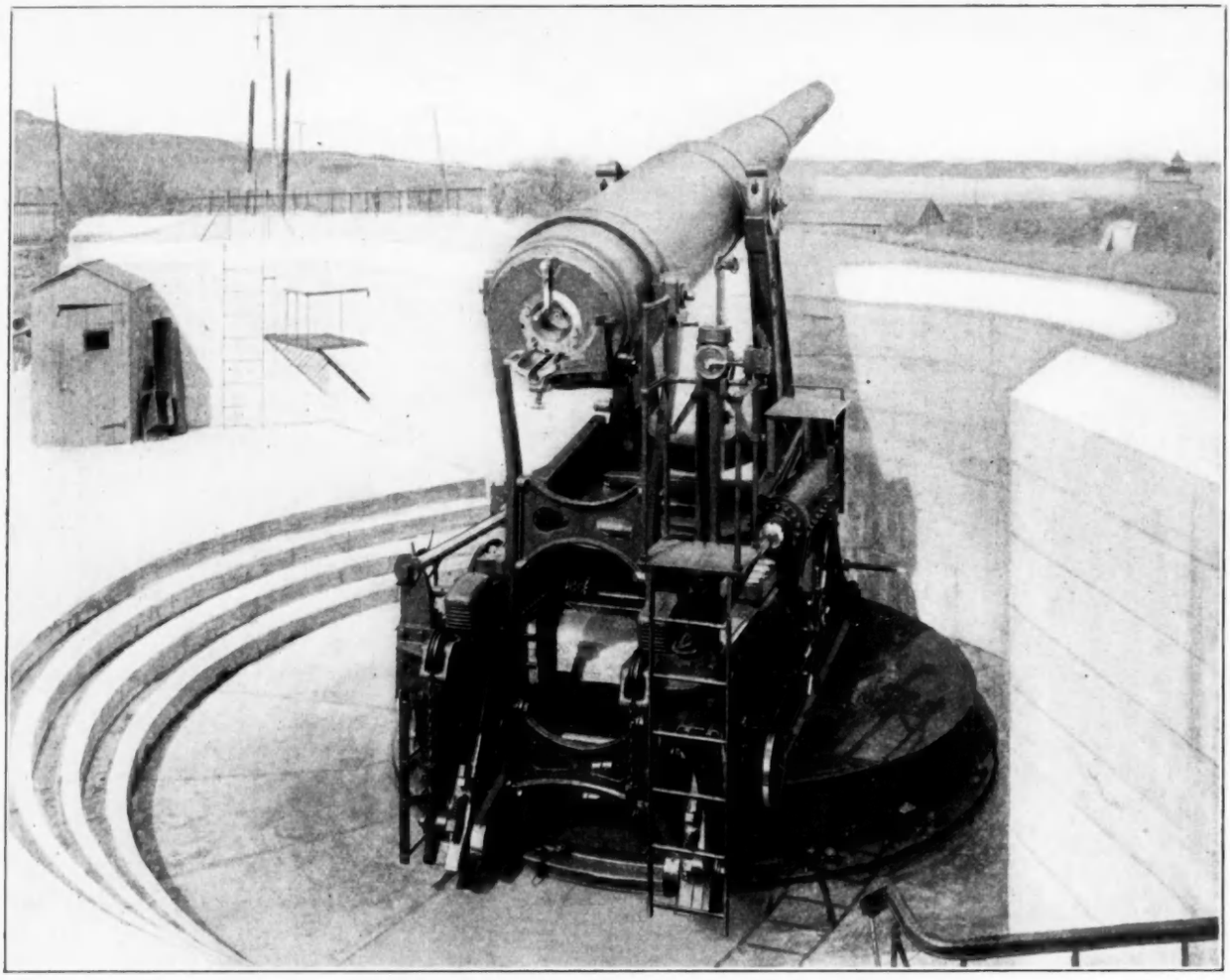


FIG. 8. A DISAPPEARING CARRIAGE IN ITS EMPLACEMENT.

FIG. 9. MOUNTING 10-INCH BARBETTE CARRIAGE AT PAN-AMERICAN EXPOSITION.

Homes of American Workmen.

BY TECUMSEH SWIFT.

If there is anything upon which I pride myself it is certainly not upon what I know or what I have, but rather upon my ability to get or to find what I want when the occasion arises. It is to this higher education of mine that the readers of the "American Machinist" are indebted for the pictures that must draw many eyes to this letter of mine. I have been thinking quite seriously (for me) of late about the homes of American workmen, and about the different styles in which they live, or about the breadth or narrowness of their lives, with a view to getting some idea of what the individual workman or the single family may or may not do as a consumer of or as a customer for the products of the labor of American workmen.

We are taking much pains in these days to cultivate the foreign customer, and are very much elated over our magnificent success in sticking our goods upon the peoples across the seas. Not every one has a very adequate idea of what our tremendous export trade amounts to. I can't go into details, but please take my word for it, as I have gone over it carefully. The total export of manufactured products from the United States for the last year, which was our biggest year, amounted to something less than $5 per capita of the population of the United States. If every person in the United States should spend for American manufactures of all kinds a nickel twice a week, beyond what is now spent, it would fully equal the total value of our export of manufactures.

It is very evident that every resident American has an important function and duty as a customer, and there is, as I contend, none so deserving of study and cultivation as he. There is of course a great difference in the habits of workmen and in their use of their earnings for the purchase of goods, and here is where the pictures come in. These show us, as it seems to me, where some of the best customers, individually, for American products are to be found, and where also at the same time they get the most good from the goods.

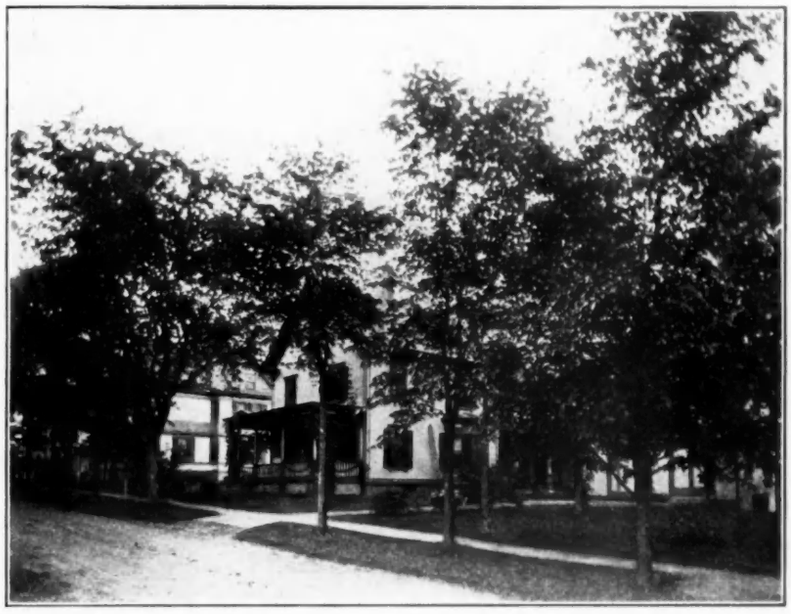


FIG. 1. HOME OF W. H. SARGENT, DRAFTSMAN, ST. JOHNSBURY, VERMONT.

Well, my happy faculty, of which I set out to speak, told me just where to get these pictures. I wrote my friend Mr. W. H. Sargent, St. Johnsbury, Vermont, who has sent many good things, and ought to send more, to the columns of the "American Machinist," that I would like to get some pictures of the better kind of homes of American workmen. I wanted to show what American workmen can do for themselves, and what they are actually doing without any help from employers or others. These pictures that Mr. Sargent has taken so successfully show only a few homes owned and occupied by workmen of the many to be found in this one small town of Vermont. Mr. Sargent writes me that, owing to the density of the foliage, he was unable to get satisfactory street views, and he only selected a few houses that lent themselves most readily to pictorial effect.

FIG. 2. HOME OF A MOLDER.

The chief industrial establishment of St. Johnsbury is, of course, the Fairbanks Scale Works, and members of the Fairbanks family have done much to beautify and to stimulate to the beautifying of the town as a whole, and most of the homes here shown are those of men employed at the Fairbanks works. The wages paid for the positions occupied are not higher than are paid in many other places.

The pictures now can be left to tell their own story. Fig. 1 is Mr. Sargent's house. He is draftsman at the Fairbanks establishment, is, I believe, a native of the town, has never worked anywhere else, and his father is still on the pay-roll of the company. Fig. 2 is the home of a molder. In Fig. 3 a "scaler" lives, and in Fig. 4 a "pivot setter." Fig. 5 belongs to an "experimental machinist." His status, I suppose, would be about the same as that of a good toolmaker. The scale works are in a valley down at the right of this picture. Fig. 6 shows the beginning of a row of houses in which live successively a machinist, a molder, a polisher, etc., probably what would be considered the average workmen of the shop. The houses shown in Fig. 7 have been won by laborers commanding very small pay. In Fig. 8 the houses all, except one which belongs

to a doctor, are owned and occupied by workmen of various trades. But few of them are Fairbanks employees.

These houses tell their own story, and they tell us of much besides what is directly visible. It is to be remembered that these are *bona fide* homes and have been acquired as such rather than as profitable investments. Nearly every house is for one family only. The great mistake of letting one floor or a part of the house is not here committted. Each house is built and maintained for the comfort and convenience of the owner and his family. The remarkable neatness of everything outside the house tells of the industry of the owner in his hours of leisure away from the shop, for most of the work of caring for the grounds and surroundings is done by the man himself. The houses compel us to believe, what is the fact, that the insides of them correspond with the outsnde. They are well and amply furnished, with pictures and books and musical instruments and the things that make for solid home comfort. The inmates are well fed and clothed, and are not deprived of any necessary thing. They know the value of money and have acquired the art of making it procure for them as much as possible. It is not easy to imagine how there can be better customers for the products of American industry than these are. It is not that they are paid more than they earn, for the Fairbanks are able to sell their scales anywhere in the world in competition with the products of the cheapest paid workers, and they have a large and wide-spread export trade. St. Johnsbury is not the only place where the workmen get for themselves comfortable and attractive homes, and I do not know that it can be called an exceptional place in any respect, for there are many places, both in New England and elsewhere, in which the workmen can be found as comfortably, or nearly as comfortably, situated. There are many places, of course, where they are not, and are not immediately likely to be. There are so many who do not know and have never had the means of knowing the better ways of living, and so they get into ruts of hopeless and aimless unthrift, and not only they, but the nation as a whole is the loser. Both the better way and the worse way are self-perpetuating, but reciprocal knowledge cannot but be helpful, and so I am hopeful that this simple presentation of a few homes of everyday American workmen will help to show some others the better way of living.

FIG. 3. HOME OF A SEALER.

FIG. 4. HOME OF A "PIVOT SETTER."

Echoes From the Oil Country.

THE FOREMAN'S FRIENDS.

A man one day came in looking for work; he had been working for a neighboring firm and had quit. His wages had been good, his work had always passed without complaint; he liked the shop and the men well enough; his only reason for quitting, so far as I could learn, was that he thought he wasn't appreciated. The foreman never told him he was pleased with his work or said anything complimentary. He said the superintendent had talked very nice to him when he hired him, but had never spoken to him since.

I sympathized with him to some extent, but thought perhaps he was some to blame too. Perhaps he never tried to do anything to help the foreman along a little. I wonder if he ever thought the foreman felt lonesome because the men never seemed to notice the things he tried to do for their benefit. The foreman gets the kicks (in a job shop) from every man who has any coming, and he often stands as a buffer between the outside world and his men. From considerations of future trade he cannot always kick back, even when he knows the initial kicking is uncalled for. As constant dropping is said to wear away a stone, so there may be reasons why a foreman loses some of his good nature and is a little short and fails to show the ready interest that good work deserves.

I have felt this way many times myself; have wondered if I ever did anything just right; wondered why I was allowed to keep my job; wondered why the same people came to the shop the second time; wondered why I could never do the smart things others were doing all over the world; wondered why it was that the more I tried and studied and worked the poorer

my work seemed to me; until I felt very blue indeed.

I really don't think too much of this thing is good, but in the midst of my gloom a bright lining has begun to show its edge. As we increased in business the drummers have taken to dropping in to look for orders. Of course the old reliable stand-by used to come every three or four months and take a list of the things we needed and tell how he found business; but to have one of those nice, sleek, well-dressed fellows drop in, call you by name, tell how he had heard of you in one of the big shops several towns away, hand out a fine cigar, express delight with the way the work is being pushed, and all that, tends to counteract the blues brought on by too much kicking. Of course, you must not believe all you hear or your head may swell; but it helps you to look on the other side, and there is lots to learn from these traveling men

I have learned that several different kinds of babbitt metals are used exclusively by all the prominent firms in the country, and that each of the makers has a brand that is better than anything made by anyone else at any price, and costs less than half as much at that. I know, for I have been told, that some firms have a secret ingredient unknown to and undiscoverable by chemists which, added to a mixture of lead and antimony, will make it away and beyond better than the best grade of "Genuine" made by any of the old-line companies, that it will stand more work of every kind, that the friction generated and the oil used are like the differential in calculus, so small that they are just nothing at all or a little less.

To occupy the proud position of being the only man between Buffalo and Pittsburgh who is not making use of this wonderful metal is something, too. I wonder how many other men "are the only man who has ever found any objection to this, and I have been selling it for years to the best shops and brightest mechanics in the country."

FIG. 5. HOME OF AN "EXPERIMENTAL MACHINIST."

FIG. 6. HOMES OF MACHINIST, MOLDER, POLISHER, ETC.

I rather pity the oil man who drops off and wastes his time trying to sell oils. He has a nice story, and he tells it well until you go to asking about viscosity and gravity, and fire and flash test and cold test, and looking through it for color, and at the bottoms of his bottles for sediment, etc., and then he often lies down. Why, bless you, you can hear and see lots of that, and more, around the refineries, and see the work going on on a large scale. A fancy name to the oil may make a mowing machine run nicer, but it don't do much good in a machine shop; neither does adding several cents a gallon to the price.

I don't suppose you all know that viscosity is something that one of the dealers has, and that he puts some of it into

FIG. 7. HOMES OF MEN OF SMALL WAGES.

his high-priced oils, just how much and what oils he puts it into is a trade secret, and of course you would hardly expect he would tell that; but he can assure you that the dealers in the common oils are only bluffing when they claim their oils have any of it in them; couldn't have at the price, you know. (I didn't learn this at the refineries.)

When first the inquiry as to price was met with an off-hand "sixty, two tens and a five, with two for ten days and five better in car lots," what an air of mystery and importance. Of course, I knew all about it, of course—oh, yes, indeed, and then it must be very simple. Just see how my friend treated it; made me think of Mike handling the chips from under the lathes. Just why he didn't say 85 and be done with it wasn't so clear just then. It got clearer later when the bill came.

We all have standards that we go by, and if everything is up to our standard

FIG. 8. HOMES OF VARIOUS WORKINGMEN.

it is usually pretty good, and, as I always believe in the real cheapness of good goods I try to buy that kind; but since I have had my little experience in belts I begin to think that either the standard was set very low to begin with or that there has been a wonderful improvement since it was set, as my "standard" belt was certainly not exactly up to my ideas of standard. Perhaps I have wrong ideas of such things as applied to the leather business. Each business, trade and calling has a language of its own in which the meanings widely differ for the same words; this may be one of them.

I was earnestly assured once that a certain very superior metal that was being urged, among its other good qualities, had the distinct and remarkable one of having an "alloy" among its ingredients. I, very foolishly, had supposed I was using a metal that was all alloy. I hope in time to master enough of the words of each of these varied languages to be able to greet my friends in their own, and to know enough of what they mean not to bring disgrace on my own calling.

To those foremen in shops where they do not have the privilege of meeting with these interesting and instructive gentlemen of the road I extend my sympathy. I know it would often lighten up the dark spots in the life of one of these to have someone come in who acted on seeing him as though he had found a long-lost brother and who could smile and shake him cordially by the hand at parting when not the sign of an order came his way.

When a bad lot of files has had to be used up it relieves the feelings a lot to have a file man drop in so that you can open up your wrath upon him and then have him agree with you and tell you how much pleasure he has received in talking with a mechanic of such sound judgment and penetration, one who understands so well what he is talking about and can appreciate improvements such as they have made since those files which have laid in stock for a long time have been made; because he surely knows, in justice to himself, you will try a lot of the good ones, and so help those who are trying to keep in the front rank of progress. You understand that he is an artist in his line when the next lot of files come.

W. OSBORNE.

Relative Speed Indicator.

The following description of an interesting and obviously useful device is from "Engineering":

Kilroy's relative speed indicator, which is manufactured by Messrs. Eyershed & Vignoles, Limited, Woodfield Works, Harrow road, London, has been devised in order that those in charge of the engines in twin-screw ships may be able to know at a glance whether the port and starboard engines are running at equal speeds, and, if not, which are going the faster. The indications given by this indicator are such as to enable the engineers quickly and easily to bring the engines to equal speeds, and maintain them so. The advantages gained in the engine-room by the use of this indicator are self-evident to

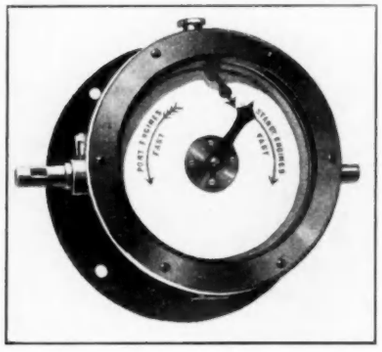


FIG. 1. RELATIVE SPEED INDICATOR.

those used to the management of marine engines. Deck officers will appreciate the benefits derived, as the equal running of the two engines, besides insuring a slightly better efficiency of propulsion, facilitates the steering of a ship under all steaming conditions.

The engraving shows an indicator. One of these would be fitted in each engine-room, suitably near the starting platforms.

When the two engine-rooms are separated by a water-tight bulkhead, the two indicators could conveniently be coupled together, one on either side of the bulkhead; as in this case, connection by shafting to the port and starboard engines need only be made to one of the two indicators. The direction of rotation of the pointer indicates the faster engine. The right-

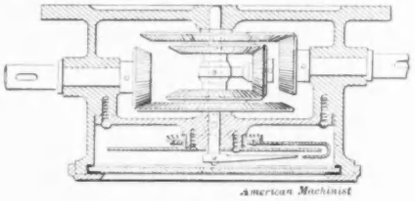


FIG. 2. SECTION OF SPEED INDICATOR.

hand shaft is joined by shafting to the starboard engines; the left-hand shaft is joined by shafting to the port engines. When both engines are running at equal speeds, the pointer will remain stationary opposite the indicator mark. If the starboard engines are running faster, the pointer will move round in the direction indicated on the dial shown in the photograph. If the port engines are running faster, the pointer will move round in the opposite direction, as indicated on the dial. The small arrow pivoted under the indicating mark is always pointing in the direction in which the pointer has moved

away from the indicating mark. Lubrication is provided for all the moving parts, an oil syphon being fitted in the usual way.

It will be seen from Fig. 2 that the shafts to be connected respectively to the port and starboard engines each engage, by means of bevel gearing, with a differential bevel gear, whose bevel pinion is mounted on an arm which is pinned to a spindle, to the end of which is fixed the pointer. An auxiliary pointer acts as the "indicating mark," and is fixed, behind the dial, to a crown wheel gearing with a pinion on a spindle, which is actuated by a knob on the outside of the instrument. This arrangement enables the "indicating mark" to be moved round the dial opposite to the pointer when necessary. The small auxiliary arrow pointer, which can be seen in Fig. 1, but which is not shown in Fig. 2, is pivoted under the "indicating mark," and has a cam attached to it behind the dial worked by a spring lever. At the back of the pointer is a spring pin or tooth, which engages in a hollow in the back of the arrow pointer in such a way as to leave it pointing in the direction in which the pointer has moved away from the "indicating mark."

A Twisting Die.

BY C. H. ROWE.

The drawings show a die that we recently made for twisting the ends of sheet brass, 1-16 inch thick and 3-16 inch wide; it can be readily adapted for other work of similar character. The slides and the method of operating them enable the material being twisted to be securely and truly held, and as all parts are hardened, the wear is almost imperceptible, so that with ordinary usage a die of this kind can be run for a long time. Any length of work can be twisted, and the twist may be made at some distance from the ends by simply making the cylinder of a corresponding length.

Referring to Fig. 1, *A* is the cast-iron base, 1¼ inches thick and beveled 5 degrees for keying into the bolster plate. The rear end is planed down to ½ inch thick, and to this is fastened by four ⅜-inch screws bracket *B*, with a ½-inch reamed hole through its center parallel with the die. The bearing in this bracket should be of sufficient length to firmly support the twisting spindle *C*. The spindle was carefully finished in the lathe to ⅞ inch diameter, turned on its rear end to an easy running fit in the bracket, and threaded in the small end for a ⅜-inch hexagon collar-nut to retain the spindle in its bearing, to prevent end play, and yet allow it to rotate freely. After turning the spindle *C* we placed it in the shaper vise and planed a groove ⅛ inch wide and down to within 3-32 inch of the center, having previously drilled a small hole *D* for clearance for the chips. Then with a tool .070 inch thick the slot was continued 3-32 inch beyond the center of the spindle, making the reduced part of the planed opening, as shown in the end view, 3-16 inch wide. A flat piece of tool steel was made to fit snugly in the wide part of the slot for its entire length and securely held in place by 1-16 inch pins, leaving in the middle of the spindle a horizontal opening, .070 × 3-16 inch, made bell-mouthed at the front end to readily receive the work. Just in front of the bracket *B*, and passing through the spindle at an angle of 45 degrees, is a ¼-inch hardened steel pin *E* to engage with the mechanism in the punch and operate the spindle. This pin is flattened at its center and is retained in place by an 8-32 screw that enters from the side of *C*. To automatically bring back the twister after the twisting operation there is provided a slender coil spring *F*. Pin *G* is driven into *A* to limit the reverse travel of the spindle *C*.

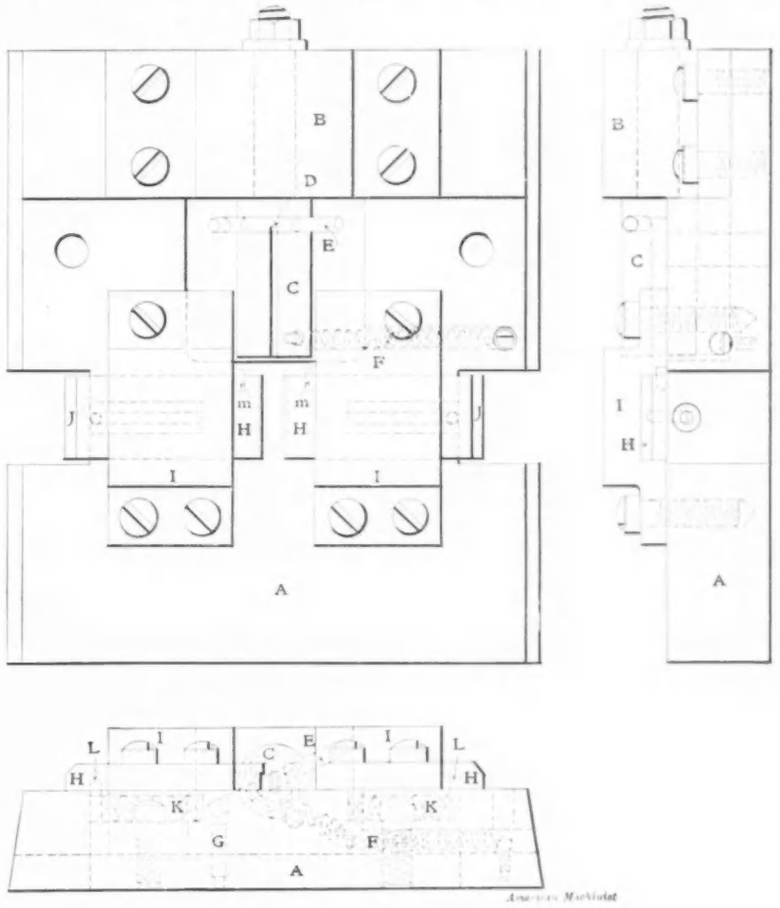


FIG. 1. A TWISTING DIE.

Mounted on the face of the die, transversely to the axis of the spindle *C*, and fairly close to its front end, are the two steel slides *H H* for holding the work rigid while the twist is being made. These pieces were finished almost to size in the shaper before hardening, and, after being slightly drawn, were sized by grinding and fitted to work freely, so that light springs will draw them apart on the ascent of the punch. The inner ends of these pieces are recessed to enable them to more securely hold the work in position and to obviate any possibility of its lifting. The outer ends of the slides on their upper corners *J J* are beveled 45 degrees, and extend out over the base, which is cut away on each side to permit the ends of the lugs on the punch to pass down when operating. To draw apart *H H* springs *K K* are located directly beneath them and press against the pins *L L*. To hold the slides on the die the cast-iron caps *I I* are screwed and doweled to its face, and for limiting their outward movement pins M M are provided.

The upper part, or punch, Fig. 2, is a very simple affair, consisting of the steel plate *A*, to which are fastened, by screws and dowel pins, the lugs *B B*, their inner corners beveled 45 degrees and made very hard to stand the wear and avoid abrasion when forcing in the slides *H* on the die. *C* is a finger that, on the descent of the press ram, turns the twisting spindle. It is shorter than the lugs *B B*, so that the slides may grip the stock before the twist begins. *D D* are pins that enter into suitable holes in the base of the die and insure a proper setting each time the tool is called into use. It is very convenient to have a die of this kind set at a proper hight for the line of vision, so that the operator can easily enter the work in the opening of the spindle. A valuable feature of this tool is that it operates more satisfactorily in a high-speed press.

Legal Notes.

BY WM. MARSTON SEABURY, LL.B.

NEGLIGENCE IN REMOVING SLIVER FROM CIRCULAR SAW WITH A LATH.

Michael Deering, while employed by the Canfield & Wheeler Company, was injured by a circular saw. The saw had a guide. It was claimed that this guide had become worn so that the space between it and the saw was greater than it should have been and that the foreman had promised Deering that it should be fixed at the end of the day. It was common for thin pieces or slivers that came from the saw to get into this space between the guide and the saw and the effect was to bind and injure the saw. It was customary for the person who operated the saw to get these slivers out of this space and this was generally done by taking a stick and pushing them out, by stopping the saw or by removing the table by taking out some bolts. Deering took a piece of lath and pushed so hard upon it that it broke, throwing his hand in contact with the saw.

Deering brought suit against his employers in the Circuit Court of Michigan, Manistee county, but judgment was rendered for the defendant upon the ground that Deering had himself acted in a negligent manner. An appeal was taken to the Supreme Court of Michigan, but the judgment was affirmed on the ground that Deering had assumed the risk of using a stick. (85 N. W. R., 874.)

Dies for Umbrella Rib Tips.

BY WILLIAM DORAN.

The dies herein described and illustrated were used for producing umbrella rib tips of black tin .010 inch thick, and they illustrate in their design and construction many practical points which can be adopted to advantage in the rapid production of various other small sheet-metal parts. The three operations necessary to produce the rib tip are shown in Fig. 1. The first operation comprises the piercing the two holes *a a*, forming the two sides *b b* and punching out the blank to the shape shown. The punch and die for this first operation are shown in Fig. 3, which gives a vertical longitudinal section of both, and in Fig. 2, which is a plan of the punch. The punch and die are made to produce two finished blanks with each revolution of the press, and as the stock to be punched was very thin, it was far cheaper and more expedient to produce the blanks this way than by two separate dies.

The die was made first, and after being planed and fitted to the bolster, the face was ground and polished and six outlines of the templet were transferred to it, getting them in the relative position and all exactly the same distance apart, as shown in Fig. 2. The two blanking dies *M M* were then worked out by letting the templet through them, and also the four piercing dies *O*, Fig. 3. The two forming dies *N N* were then finished to the shape of the face of the blank, Fig. 1, by first using a round face end mill to rough out and then a graver; they were then lapped and polished on the drill press. After the hole for the stop-pin L and those for the stripper screws and gage plate dowels were let in and tapped as required, the die was hardened and drawn slightly, leaving it as hard as possible without danger of cracking or chipping. The piercing dies *O* were then lapped to size, and the face of the die was ground and oilstoned.

The punch consists of the cast-iron holder *H*, the stem of which is turned to fit the ram of the press, and the pad *D*, of machine steel, in which the punches are fastened. The two blanking punches were made first and finished to size by shearing them through the dies *M M*, leaving them a tight fit, as the metal to be punched necessitated. Both punches were then let into the pad *D* and upset or riveted at the back. The four piercing punches were got out and located within the pad, as shown, transferring the holes for them through the dies *O*, and then enlarging them to the size required. The two forming punches *F F* were pieces of square tool steel, first let into the pad and the face of each then worked away to fit within the dies *N N*. These two punches were the only ones hardened, as, by leaving the blanking and piercing punches soft and having the die as hard as possible, it could be worked steadily for a long time without being ground. After the stripper plate *I* and the two gage plates *J J* were located and fastened on the face of the die and the gage pin *L* let in, the punch and die were set up in the press.

The metal to be punched came in rolls of the proper width, and was set on a reel at the side of the press. The end was fed against the stop-pin *L*. For the first two strokes the four blanks produced were waste, but after that two complete and perfect blanks were produced at each stroke. As will be seen, the two blanking punches *E E* and the four piercing punches *G* are left longer than the two forming punches; this is so that the metal will be held securely while the forming punches are drawing it, thereby allowing the metal to be drawn sideways without disturbing their relation or altering the distance between the different operations.

For the second operation, that of bending and forming the blank to the shape shown in the center drawing of Fig. 1, the punch and die shown in Fig. 4 were used. It is what might be called a common push-through die, and is about the simplest and cheapest that could be adopted. The punch holder *P* is of cast iron and is fitted to the ram of the foot press. The face is dovetailed to admit the punch *Q*. The face *R* of the punch is rounded to the proper radius to which the

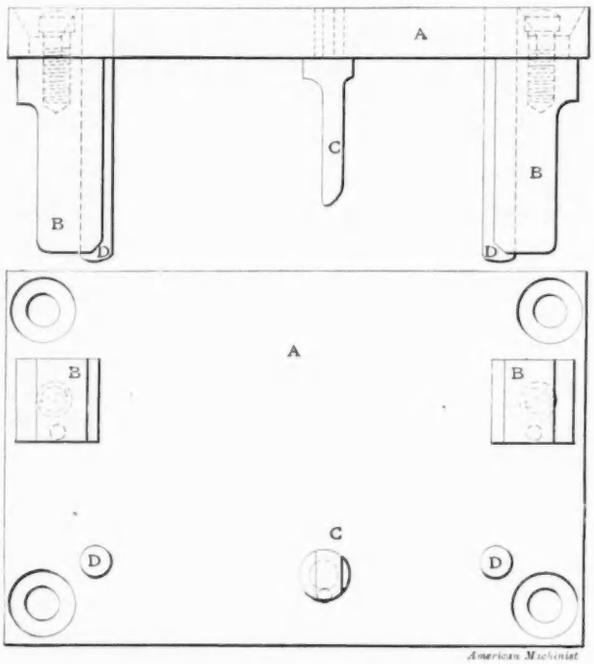


FIG. 2. THE UPPER PART, OR PUNCH.

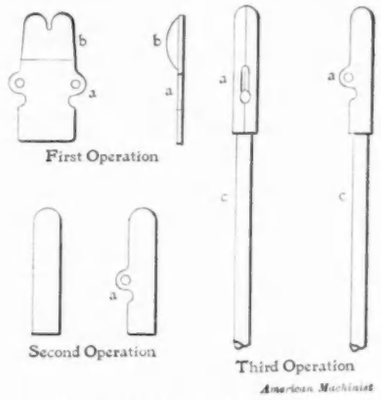


FIG. 1. THE THREE OPERATIONS.

tips are to be finished—that is, one-half of a circle, as shown. The die *T* is fitted to the bolster *X* and is worked through at *U*, in width two thicknesses of metal wider than the punch. The gage plate *S* is fastened to the face of the die and worked out at *V* to allow the blanks to fit in nicely. The edges of the die are slightly rounded and the inside is polished smooth. Both punch and die are hardened and drawn slightly.

For the last operation the punch and die shown in Fig. 5 are used. This operation consists of finishing the tip and closing it around the rib *c*, Fig. 1, so that the two eyelets *a a* of the blank will match. The punch *Y* and the die, after being finished all over and fitted to holder and bolster, have the faces ground, and are then clamped together, and a hole of the required diameter is drilled and reamed through them, so that a perfect half circle will remain in the face of each. A half-round groove is then let into the center of the punch face and the edges are rounded; this acts as an inlet and sizer for the two eyelets. Both punch and die are hardened. To set this punch and die in line with each other, the gage shown at the right of Fig. 5 is used, the portion *E E* fitting the half circle of each, and the tit *D D* fitting within the groove in the punch. One of the second operation pieces is placed on the die, resting within the portion *B B* and against a stop at the back. The rod on which it is to be fastened is then laid within it, thereby serving as a horn. The punch descending forms the tip to a perfect circle, rivets it on to the rod or rib and sizes the eyelets *a a*.

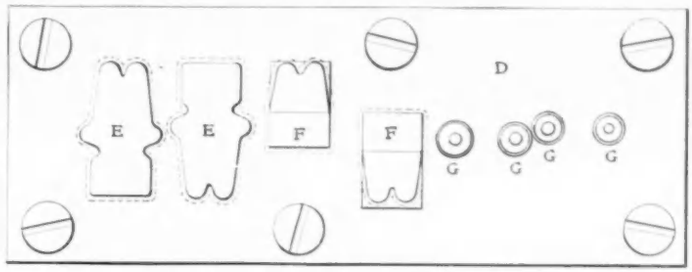


Fig. 2

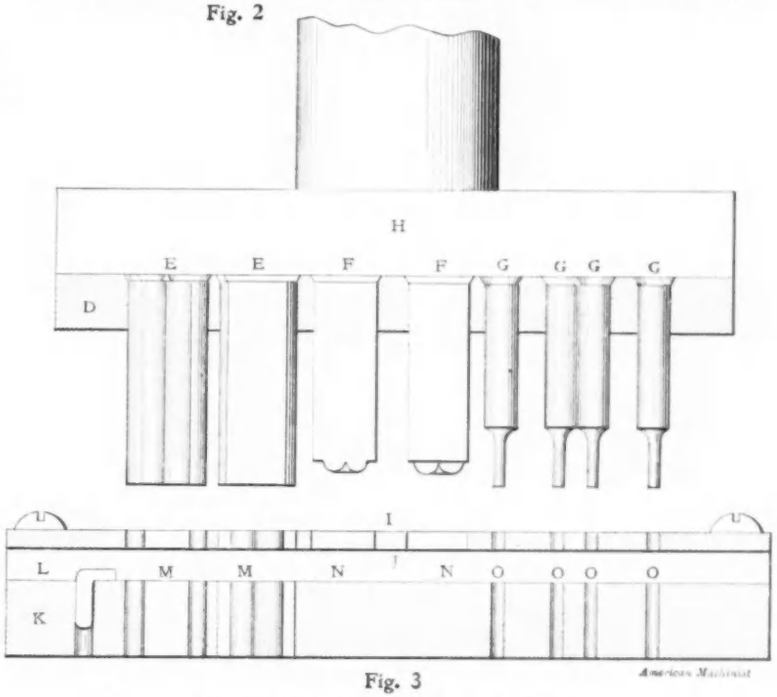


Fig. 3

PUNCH AND DIE FOR FIRST OPERATION.

A Novel Engine.

The following interesting bit is from an account of an "engine" which has been "invented" in Missouri. It has been already printed and reprinted. It will be seen that the engine employs some distinctly new principles. Converting the steam "directly into power and action," so that none of it reverts to water, we presume, is one of these; "applying either boiler pressure or steam, with expansion to start it," is another and perhaps more complicated principle. That the most important feature of the invention should be the preventing of wear on the boxes is another striking novelty.

"The chief features of Mr. Stoner's engine are two four cogwheel pistons enclosed in a cast boxing resembling a figure 8. Through a series of ducts the steam is admitted into this boxing and converted directly into power and action in such a manner that there are no dead points. While having only one pair of rotary cogwheel pistons, Mr. Stoner has an engine so arranged that by using a single lever attached to a circular plate valve having a series of ports he can reverse and apply either boiler pressure or steam, with expansion to start it, and can operate it with practically the same economy of steam as a Corliss. The most important feature about the engine and the one upon which Mr. Stoner relies to make it practical is an arrangement to prevent the wear on the boxings, because of which most rotary engines have failed. By means of this device all the friction on the bearings is overcome. One of the chief uses to which Mr. Stoner thinks his engine may be put is providing propulsive power for steamships."

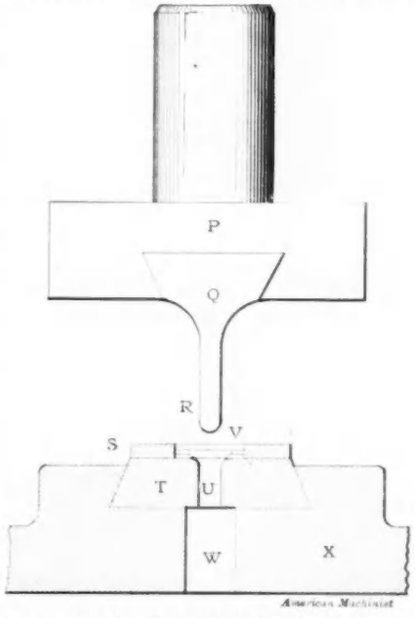


FIG. 4. PUNCH AND DIE FOR SECOND OPERATION.

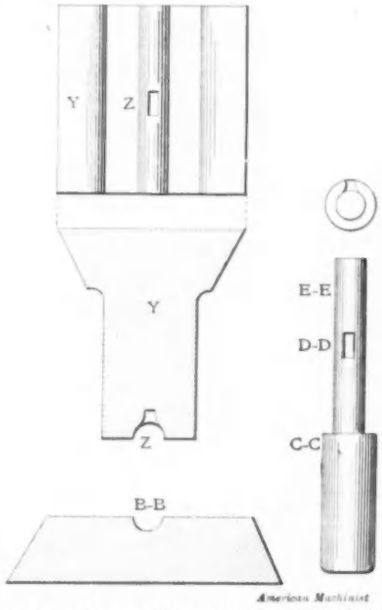


FIG. 5. PUNCH AND DIE FOR THIRD OPERATION.

Letters from Practical Men

Storekeeper's Account of Supplies—Hobbing a Double-Thread Worm Wheel With a Single-Thread Hob.

Editor American Machinist:

I enclose a sketch of a sheet for keeping account of the amount of supplies given out to the workmen.

My plan is to let each man have all he wishes by going himself or sending another with his written order direct to the storekeeper and thus save much time waiting for the foreman's order, as he is not always around or may be engaged with other duties. Moreover, the time the foreman takes making out these orders could be devoted to more important work.

It will be noticed that the labor necessary on the part of the storekeeper in charging up the articles could hardly be less, as all he has to do is to place a dot in the proper square, never putting more than a given number of dots in each, and always placing them in the same order. At the end of every month, or at times thought best, the sheets could be taken to the foreman for his inspection, when he can at once see the comparative amounts used by each man.

	¼ lb Cotton Waste	3 Sheets Emery Cloth	2 Hack Saw Blades	1 Twist Drill under 1/8"	1 " 1/8" to 1/4"	1 " 1/4" to 3/8"	1 File under 6"	1 " 6" to 8"	1 " 8" to 10"	1 " 10" to 12"	1 Tap under 1/8"	1 " 1/8" to 1/4"	1 " 1/4" to 3/8"	1 " 3/8" to 1/2"			
T. Jones	•••	••	•		•	•	••	•	•		•						
F. Taylor	••	•	••					•				•					
W. Brown	•••••	•••••	•••	••	••	••••	••••	••••	••	•	••	••	•	•			
J. White	••	••	•			•		•	•								

American Machinist

STOREKEEPER'S ACCOUNT OF SUPPLIES.

Some time ago one of your correspondents told how he hobbed a left-hand worm-wheel with a right-hand hob.* Shortly afterwards we had occasion to cut a worm-wheel to suit a worm 1 inch pitch cut in two—in other words, ½ inch pitch double thread. We had a hob the right diameter, 2⅜ inches, ½ inch pitch, which we used and got an excellent job by setting the wheel at the proper angle to suit the hob the same as your correspondent did, only in our case the error was only cut, as soon as the jig is turned in the least from a line parallel to the under block, it will rock on two diagonal corners, which would necessarily affect the shape of the tooth, and this he would have to do, to cut the curves forming the flanks.

Aside from this, if it could be made to work, all the lines would have the same bevel, but all would not run to a common center. If the lower block had been made spherical, and the jig made to conform with it, there would be no need to tip the table and all lines would run to a common center, as they should do.

Furthermore, in fastening his jig to the "lines" on the rim, he adopts the very method he criticises so sharply in those who form the teeth first and glue to lines afterwards. Surely the one is as incorrect as the other.

Again: he lays out the inside—that is the small end of the teeth—and cutting from this end, any slight error would be magnified at the opposite or large end. If the rig would work at all, why not make the under block rounding and the tooth jig hollow, reversing the operation, which would diminish any error which might occur. Teeth cut by his method may answer for rough work, but the shape produced would be far from correct.

While on the subject of gears, I wish to describe a method of producing fine lines especially adapted for the outlining of gear teeth. Varnish the ends of the teeth to be laid out, with *black* shellac, and when thoroughly dry smooth with fine sandpaper; add another coat of black shellac and repeat the smoothing operation, after which add a third coat—the smoother and more polished the better. In laying out the teeth use very fine divider points or scriber, and when this part of the work is finished, rub a piece of fine chalk on the fingers or thumb and pass over the ends of the teeth; this will leave a deposit of chalk in the lines, while the surplus dust may be wiped clean with the palm of the hand, leaving the fine white marks in sharp contrast with the black ground. The chalking operation takes but a few moments, while the more common practice of penciling in the lines after scribing is more tedious and does not produce as clear results. S. H. Ortway.

*See issue No. 42 of last year.—Ed.

Making Teeth for Gear Pattern—Fine and Clear Marking.

Editor American Machinist:

In your issue No. 27, under the above heading, our old friend "Bob" endeavors to illustrate his method of sawing correctly the teeth of miter and bevel gears.

It looks to me as if he had left an opening "as big as a barn door" for Mr. E. S. Newton or his patternmaker to whack back at him for his caustic, though justifiable, criticisms of their gear construction. If his sketch is right, his method must be wrong. Referring to the curved block upon which rests the jig and tooth to be

J. J. Stevens.

Galt, Canada.

A Gas Engine Cylinder Pattern.

Editor American Machinist:

I send herewith sketches of a water-jacketed gas-engine cylinder with its pattern, core boxes and core. While the subject is not a new one and others may be able to suggest quicker ways of accomplishing the desired end, I present this

method as embodying possibly one or two points of interest, and as one that gives excellent results.

The cylinder casting is shown in Fig. 1 as it would come from the sand with the exception that the ports *N N* are drilled in instead of being cored, as might be inferred.

The pattern Fig. 2 is something of a departure from the usual practice in that the core prints are made the full size of the pattern, thus requiring but one set of staves instead of three, as shown by "Hobo" on page 232. I use a modification of his 2x4 through-pieces, the difference being that instead of two I use but one, set but half way into the cope half of the pattern, with corresponding notches cut into the opposite halves of the inner heads. Then, instead of running through the end heads, the 2x4 is cut to fit just inside. This makes of it an excellent dowel as well as a stiffener to the pattern.

The main core box, Fig. 3, is shown arranged for making the lower half of the core. To make the upper half the block *A* is changed to the opposite side, thus giving right and left halves. The enlargement of the print is equal to the thickness of the inner wall of the cylinder and therefore fits the inside of the jacket core.

The circle of the ends of the jacket core box, Fig. 4, is the same diameter as the inside of the jacket space and thus serves as a guide for a sweep to form the core. The blocks *C, D, E, F, G* are to give the metal for the studs and to space the outer and inner walls. These blocks are held in place by means of a screw and a dowel and are just cleared by the sweep. After sweeping they are unscrewed and taken out and green sand tucked into the opening, after which the whole space is riddled full of green sand, a dry plate put on and the whole rolled over and the box drawn. The large block *B* which gives the metal around the gas port is then reversed with *C* and the other half of the core made.

As before stated, the print is made full size of the pattern and this necessitates the enlarged print in the jacket core box as shown. This is undoubtedly more expensive to make than a straight core box, but it is about offset by the cheapening of the pattern, leaving then as a credit to this style of box the fact that there are no sharp green sand corners in the mold to crush off in setting the core. The result is better ends on the casting, an important item in the machine shop.

My method has been to stave these boxes up small and bore them out in the lathe with a boring bar, which is another item of expense on the patterns, but one that results in such true castings that a minimum of metal needs to be allowed for finishing.

Another point that should not be overlooked is that of making the core boxes about $\frac{1}{8}$ inch deeper than a half circle which gives the coremaker a chance to rub his cores to a nice joint.

On page 465 "Old Bob" criticises the circular-saw method of grooving staves to fit circular heads. He is right as to the error, yet I dare say he has drawn ellipses many times by means of circular arcs, and in cylinders that are anywhere near the size of the saw used the error is too small to be found, with the advantage that it is a much more rapid method than that of cutting flats on the heads.

G. F. D.

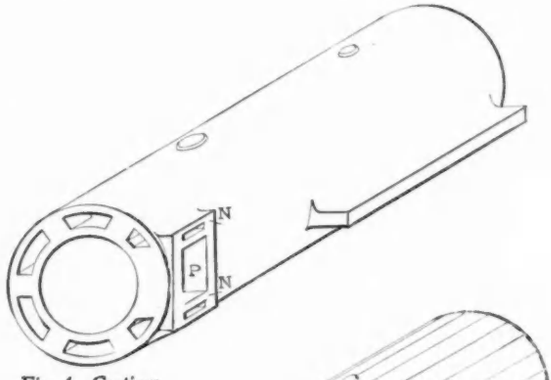


Fig. 1. Casting

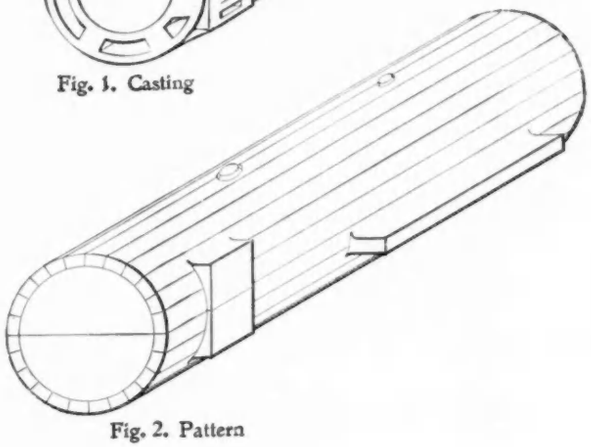


Fig. 2. Pattern

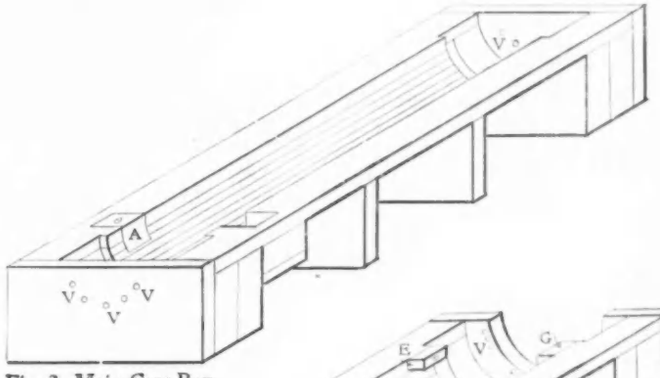


Fig. 3. Main Core Box

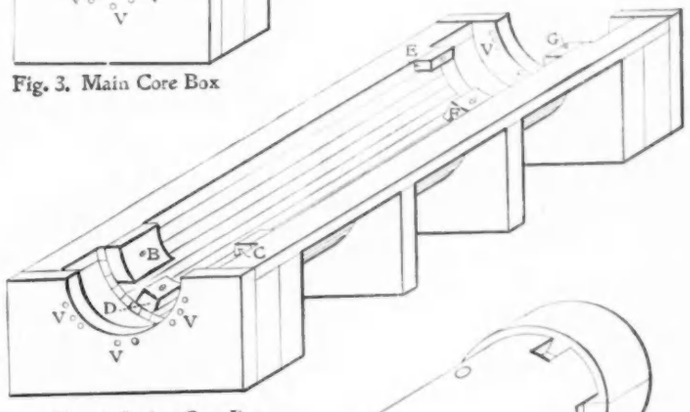


Fig. 4. Jacket Core Box

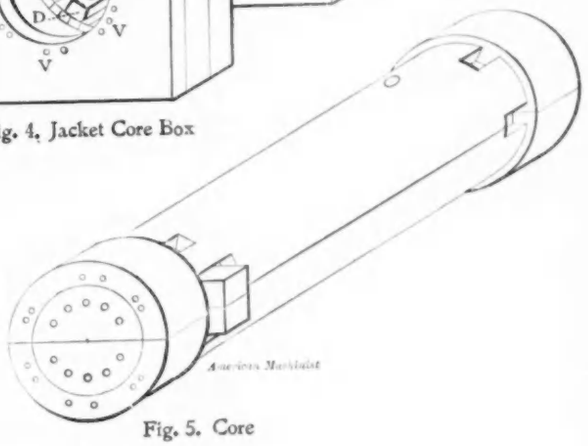


Fig. 5. Core

A GAS ENGINE CYLINDER, PATTERN AND CORE BOXES.

A String Jig.

Editor American Machinist:

While the use of "string" jigs is in most cases to be avoided, it sometimes occurs that for certain work anything more suitable could not well be devised.

By this is meant that when the idea is properly applied the resulting work is done in a satisfactory manner, but when not, the attempt results only in loss of valuable time, vexation to the operator and loss of material and work previously

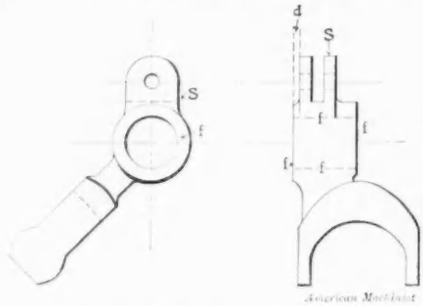


FIG. 1. THE PIECE TO BE MILLED.

performed. Almost all such failures are directly due to the fact that those portions of the pieces which are already finished and by which they are to be secured or from which additional settings must be made are not of uniform dimensions.

The accompanying sketches show a string jig for milling clutch forks for feed mechanisms for milling machines of which several were made and which were a complete success.

In Fig. 1 are shown two views of the fork showing slot *S* to be milled to a certain width, which was governed by width of cutter, and at a certain distance from one end of the hub, as shown at *d*, and having previously been bored and finished as shown by *f*. In Figs. 2 and 3 are shown end and side views respectively of

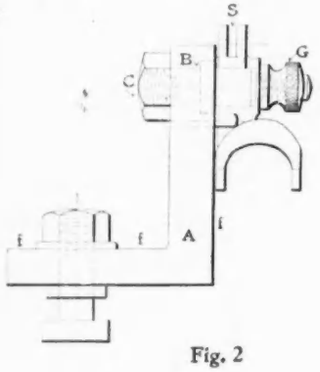


Fig. 2

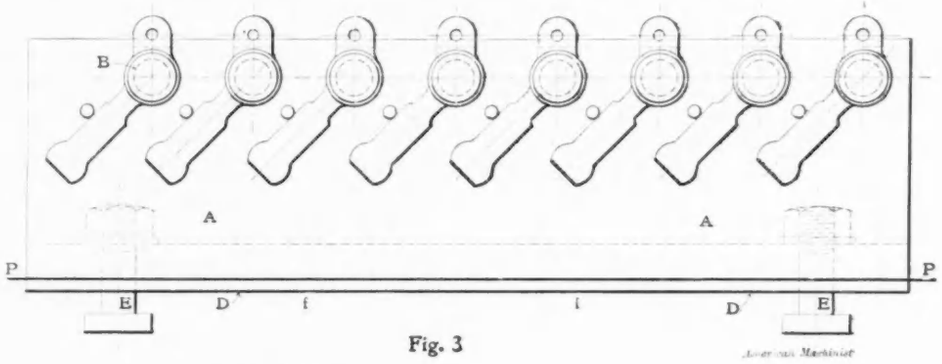


Fig. 3

A STRING JIG.

an angle iron *A* of cast iron having eight steel studs *B* inserted and secured by nuts *C* and of a diameter to fit holes in forks, and secured to platen *P P* by tongue *D* and bolts *E*. *A* is finished as shown at *f*. Each stud *B* has a knurled thumb-nut *G* fitted to screw loosely upon its outer end for holding clutches in place. It would seem at first glance that they would jar off, owing to inability of operator to tighten them sufficiently by using his fingers only, but it was found that only a very light tension was required.

This rig enabled us to finish the pieces about four times faster than we had been able to do with an ordinary vise, and when their uniformity was considered the saving was still greater. The rig is shown as holding only eight pieces, but its length of course could be made to conform to effective length of feed of machine upon which it is to be used.

A. B. CHRISTMAN.

Gates and Gating.

Editor American Machinist:

Knowing how and where to gate a casting is a very important thing in molding. Take, for instance, the casting of a flywheel, which for certain reasons cannot be gated conveniently at the hub, so from necessity is "run" from the arms. Many molders would cut a gate into the arm at right angles, as in Fig. 1, and in nine cases out of ten the casting would be found full of slag and dirt adjacent to the gate. This is caused by the iron being diverted in its flow and forming an eddy, where the impurities accumulate. To avoid this the gate should be cut to strike the arms at an acute angle, as in Fig. 2. This mode of gating applies only to wheels weighing 1,500 pounds or less. A larger flywheel should be gated either at the hub or the rim, and if the latter, it will be necessary to pour "double," on account of the distance the metal would otherwise have to travel.

A few years ago I witnessed, in an Ohio foundry, a practical demonstration of the importance of gating, the piece involved being a hydraulic cylinder, cast on a frame very much resembling a vertical engine frame; this was cast horizontally, the pattern being made in halves. It was gated on the cylinder end, about midway of the bore. Three were cast in this manner, and each one, as soon as bored out, was consigned to the scrap pile, as all were found to be spongy opposite the gate, the iron acting exactly as stated in the case of the flywheel, notwithstanding the fact that a skim gate was used. Different theories were advanced to account for these defective castings, some saying the cores were at fault; others, that the vents did not have free outlet, etc.; but on the next one being cast a little attention was given to the gating. In this instance the casting was gated on the frame end, in-

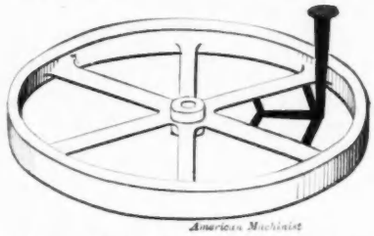


FIG. 1. HOW NOT TO GATE THE ARMS.

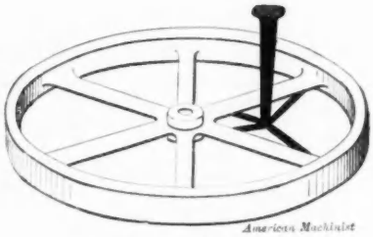


FIG. 2. BETTER GATING.

stead of the cylinder end, so that if any defects were present they would be located where the least possible harm would result, and, as predicted by the man who made this suggestion in regard to the gating, the casting proved to be a faultless one in every respect. H. W. BURY.

A Golf Ball Pattern and its Making.

Editor American Machinist:

Fig. 1 shows a plan of one-half of one of these balls, and Fig. 2 a section—the pattern being made in pieces in order to draw it from the mold. The six pieces forming the central portion of the ball were first gotten out to templet and fitted together with great care and then fastened to a lathe face-plate with soft solder, the joint at the center of the ball was faced, the hole bored and a slightly taper recess made for the locking ring *a*. They were then reversed, the other side was faced, slightly conical as shown, and the pin *b* was inserted. The end piece was then

made with a conical face to fit, threaded for the stud shown detached in Fig. 3, and a key-way cut for pin *b*. The half ball was then turned almost to finished size and the first groove was turned in; that is to say, the groove nearest the center line of the ball, this groove being used to chuck the ball truly when it is wholly assembled. The other half being made concurrently with the first, the whole was then assembled and chucked by the first-named groove on a suitable chuck, soft solder being used to hold the ball in position. It was then turned up to size, grooves were cut in one half and, after being reversed, the part hidden at the first chucking was similarly turned and grooved. It was then necessary to cut a number of grooves at right angles to the first, the surface of a golf ball being cut up into squares, so the process had to be repeated.

Fig. 1

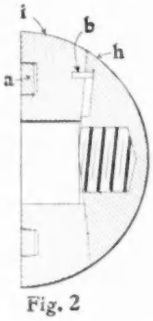


Fig. 2

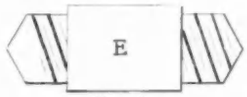


Fig. 3

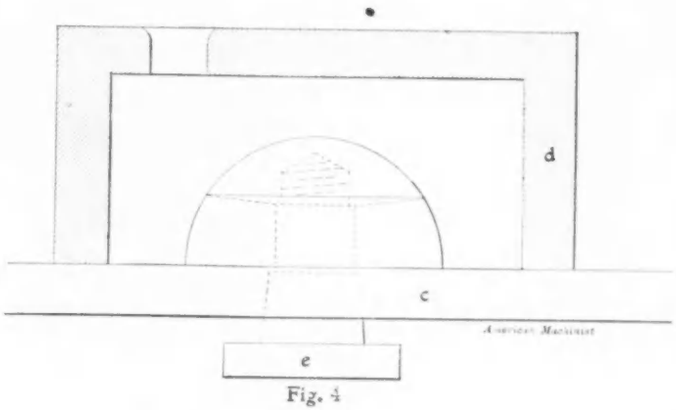


Fig. 4

PATTERN FOR A GOLF BALL.

The halves are placed, when making the mold, as shown at Fig. 4, *c* being an iron plate, the hood *d* being of brass. At *e* is a screw with a tapered shoulder where it passes through the plate and binds the half ball down. Type metal is poured in and the mold formed. The necessity for making the ball in segments becomes apparent when it is desired to separate it from the mold, as the metal filling the grooves would otherwise hold it firmly. The locking ring *a* is first removed by screwing a pin in the tapped hole *f* and lifting it out, when the other pieces may be freed and removed by pins inserted in holes *g*. Pin *b*, Fig. 2, is placed so that the parts will always assemble in the same position. The form of groove at *h* is slightly different from that at *i*, this allowing the easier removal of the end piece.

The balls were turned in a home-made ball-turning fixture of the usual type, with a face-plate mounted on a piece bolted to the shears of the lathe and fitted with worm teeth and a worm for turning it. The tool rest was the chief novelty, its peculiarity being that in it the functions of screw and slide were performed by the same piece.

Fig. 5 gives three views of this part of the outfit. At *a* is a casting fitted to receive a triangularly shaped piece *b*. This is a piece of steel turned up and threaded and then milled to a triangular shape to fit *a*, leaving a portion of thread at each angle. The piece *c* is a close working fit in the channel of piece *a* and is threaded on the inside to fit the threaded portion of the piece *b*, the whole when together forming what may be called the cross-slide of the device. The two knurled screws *d e* are for binding the triangular piece down when a cut is being taken. The tool is of ¼-inch round steel, and *f* is a stop for regulating the depth of cut.

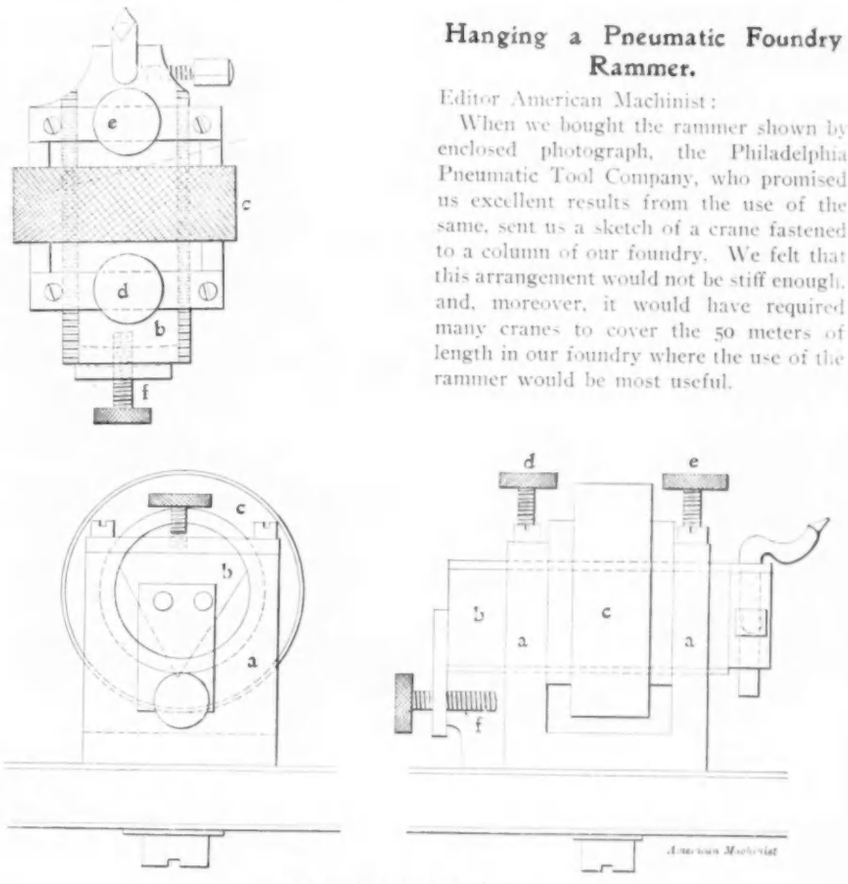


FIG. 5. A NOVEL SLIDE REST.

Hanging a Pneumatic Foundry Rammer.

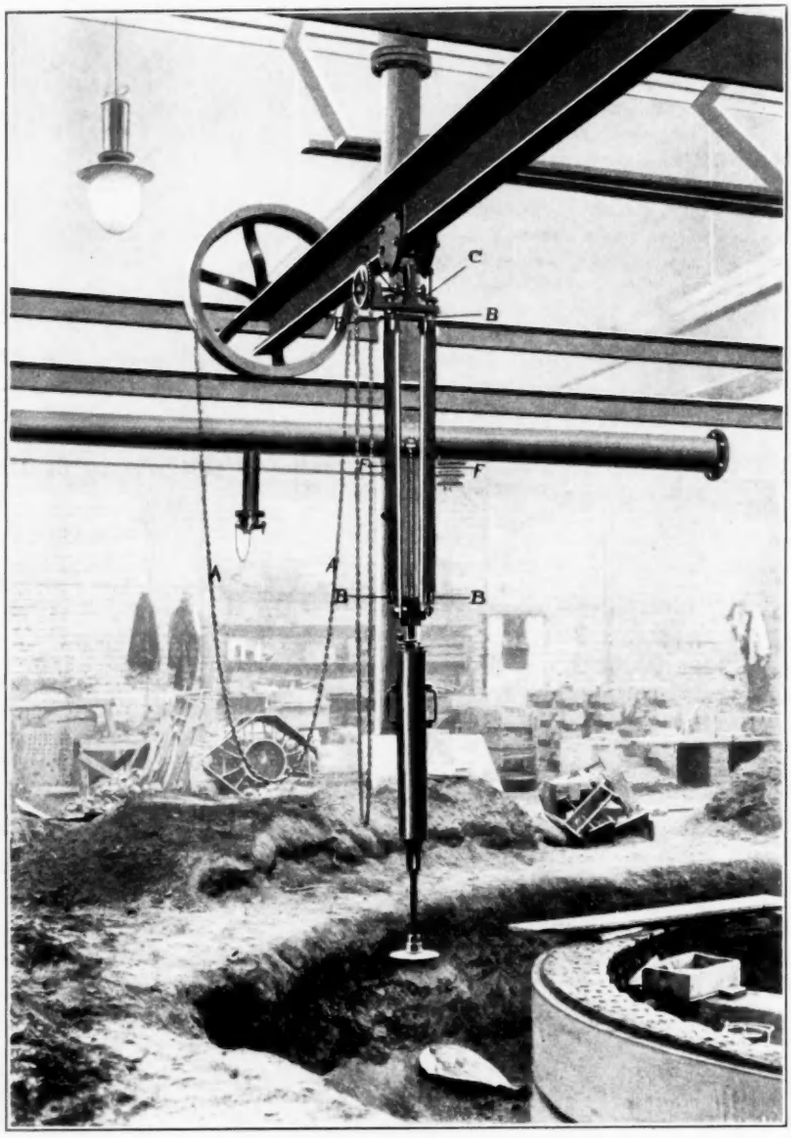
Editor American Machinist:

When we bought the rammer shown by enclosed photograph, the Philadelphia Pneumatic Tool Company, who promised us excellent results from the use of the same, sent us a sketch of a crane fastened to a column of our foundry. We felt that this arrangement would not be stiff enough, and, moreover, it would have required many cranes to cover the 50 meters of length in our foundry where the use of the rammer would be most useful.

At first we used the rammer hung from our traveling cranes, but that was not practicable, because it monopolized the machine when needed for other work. We therefore planned a small traveling crane especially for the rammer. This we wished

to be light, because we hoped to traverse it without the chain *A* of the photograph, and for the same reason we fitted the axle, which unites the two wheels and passes above the beam, with ball bearings. A web plate was riveted to the upper flange of the beam to secure rigidity with a minimum of weight.

This arrangement gives us entire satisfaction. One of the helpers who throws in the sand also operates the chain *A* now and then.



HANGING A PNEUMATIC FOUNDRY RAMMER.

The rammer, as we received it, had not sufficient length of feed, and we therefore added the two screws *B*, acted by the gears *C*, the chain wheel *D* and the chain *E*, which is conveniently placed for the molder. For proper guidance of the screws they are enclosed in two pieces of pipe *F*.

ARTHUR BOLLINCKX.

Brussels, Belgium.

[Our readers will not fail to note the use of a single large wheel for carrying each end of the crane.—Ed.]

A Device for Measuring Angle Cutters.

Editor American Machinist:

We have a large amount of grinding to do on 90-degree milling cutters which have an angle of 45 degrees on either side of center line. The job for which the cutters were made requires that they be ground and gaged very accurately. The length of teeth must be equal on either side, bringing the points central with the sides of the cutter, as they run in pairs and are expected to reverse, or change places, on the cutter arbor.

The cutters in the several pairs which we keep on hand are of equal thickness, being ½ inch thick by about 2¾ inches diameter, when new. We experienced some difficulty in devising a gage with which we might prove that our cutters were correctly ground before sending them out to the machine room. We tried several methods of gaging with as many different degrees of success. The last method tried proved entirely satisfactory, and we have continued its use for this work.

When the first lot of cutters were ready for grinding we tried to do an accurate job in about the following manner: The sides of the cutters were first ground parallel and, as above stated, the cutters were finished to ½ inch thick. We next ground the teeth of one cutter as nearly right as possible by measuring with a scale; then, placing it on a cutter arbor in the milling machine, a cut was taken through a piece of 5-16 inch stock clamped in the vise. We then reversed the cutter on the arbor and milled back through the cut, noticing which side of the cutter cut away stock. A few "cut and try" operations were then performed, which consisted of grinding the high side and milling new notches until finally the cutter would reverse and pass through the cut, nicely cutting away a wash of copper solution. Leaving the cutter in its position on the arbor, a notch was milled in a piece of 5-16 inch stock to be used as a gage, Fig. 1, with which to test the grinding of the other cutters. Now having a gage for the job we proceeded as follows:

Setting the head on the grinder at 45 degrees and mounting a cutter on the holder, one side was ground until all the teeth on that side were brought to a sharp edge. Then reversing the cutter on the holder and swinging the head around 90 degrees for the other side, we ground off light cuts, testing with the gage after each cut around to ascertain when all the cutting edges on this side were of the same length as those on the first side ground. Each tooth of a cutter in this condition would exactly fit the gage. But we found that some of the teeth were ground down to size before others, and that when the high ones were ground to fit the gage fairly well, the low ones were too low, thus leaving us in the dark as to whether both sides of the cutter would cut alike or not. Moreover, cutters gaged in this way were frequently returned from the machine room with complaints that they did not mill a smooth finish, or that the grooves milled were not of equal depth, or perhaps some other defect would be mentioned, any of which would render the cutters unfit for use. It did not require a great deal of experimenting to convince us that this gage was not just what we needed, nor was it the fault of the gage. It was assumed that the cutter grinder would grind both sides of the cutter concentric, and also that the cutter would rotate (while being ground) in a plane at right angles to the axis of the holder. We found, however, that we could not depend upon a high degree of accuracy in this respect, and we also found that the teeth were ground a trifle irregular, some of them being noticeably higher on one or both sides than others, notwithstanding the fact that each side of

the cutter was ground on a fixed center. Another serious objection to this gage was the difficulty of grinding the diameters of the cutters in each pair alike. To do this one cutter was first ground in the above described manner and its diameter measured with a micrometer. Then we ground the second cutter to the same diameter by grinding off the points of the teeth parallel with the axis. Now, to reduce the teeth to gage size we could not grind off just the amount of stock that should be ground from one side and then reverse for the other side and finish, because our gage gave us no indication where the stopping point should be on the side first ground. We might grind off too much from the first side and not discover our mistake until we found our diameter too small, which would be the case when the teeth were finished by grinding the other side until they fitted in the gage. This would make it necessary to regrind the first cutter to reduce its diameter to that of the second cutter ground. For this reason it was necessary to take light cuts from both sides of the cutter, reversing the cutter and swinging the head around after each cut in order to keep on the safe side and finally bring the points of the teeth up exactly on the center line of the cutter, when the gage would fit. This would be a tedious operation and occupy too much time, so we began casting about for an expedient whereby a number of cutters might be ground to a given diameter without the annoyance of resetting.

We decided that we should have a measuring device, and Fig. 2 is a sketch of the rig we planned and made with which to measure the cutters. It consisted of two rings ground and lapped to fit one within the other, as shown, the outside ring being hardened and the ends ground square with the axis. The inside diameter of the hardened ring was of a size which would allow it to pass only a short distance over the sides of the teeth, as shown, thus allowing for grinding, as the ring would rest a little nearer the points of the teeth after each grinding, and if it had been made much larger than was necessary for use on new cutters the diameters of the cutters might be reduced to the inside diameter of the ring before the cutters were used up, when new rings would have had to be made. The object in using the inside ring is to keep the large ring square with the sides of the cutter when measuring. A micrometer or vernier depth gage may be used to measure the distance down to the side of the cutter, or to the top of the inside ring. We use a Brown & Sharpe vernier gage, Figs. 2 and 4. In measuring by this method our practice is to first grind one side of a cutter and apply the rings and depth gage, as shown in Fig. 2, measuring to a point on the cutter near the hole and noting the reading on the vernier. We then take a light cut from the corresponding side of the other cutter, remove the cutter and measure as before. If the gage shows that there is more stock to remove, we replace the cutter in the same position and take another light cut around, repeating this operation until the side of this cutter or the corresponding sides of as many as we may have to grind at one grinding, are reduced so that the depth gage registers the reading first noted. If, however, there are several pairs of different diameters to grind, it is best to grind each pair alike, setting down the several vernier readings. We then reset the head for the other side and grind the side of each cutter until the vernier registers the same as on the opposite side. By this means of measuring we have to swing the grinder head around only once. The time occupied in grinding was greatly reduced and the task of grinding became pleasant and interesting instead of irksome. Then, too, the cutters sent to the machine room remained in service until dulled.

FIG. 1. THE FIRST GAGE.

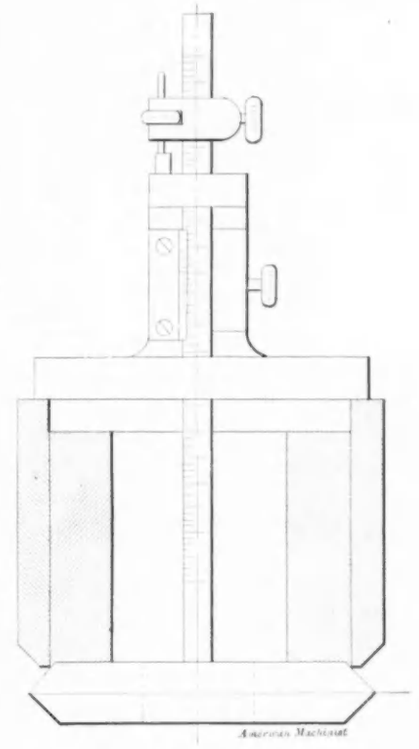


FIG. 2. THE FIRST MEASURING DEVICE.

We were satisfied with this measuring rig until we discovered that while the cutters thus gaged had done the work well, it did not afford absolute proof that the cutters were properly ground. Suppose, for instance, a cutter should be ground as shown in Fig. 3, which shows an exaggerated view of how it might be ground by reason of a loosely fitting arbor or holder, which would allow the two sides to be ground eccentric to each other in case (as with us) the cutter had to be reversed in order to grind both sides. Now the depth gage might register the same for either side, still it would not prove that the cutter would do the work properly or that two cutters ground and gaged in this way would cut alike. The reason is that the outer ring, when placed on the cutter, finds the center on which that side was ground instead of the center on which the cutter rotates when milling; thus, instead of gaging from the high teeth (or possibly only one tooth), which actually do the work, it shifts over, allowing the ring to rest nearer the points of the teeth, making the distance from the top of the outside ring to the side of cutter less than it would be if the rings were held concentric with the hole in the cutter.

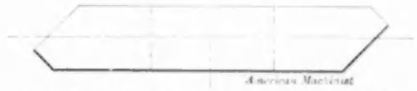


FIG. 3. A POSSIBLE ERROR IN GRINDING MAGNIFIED.

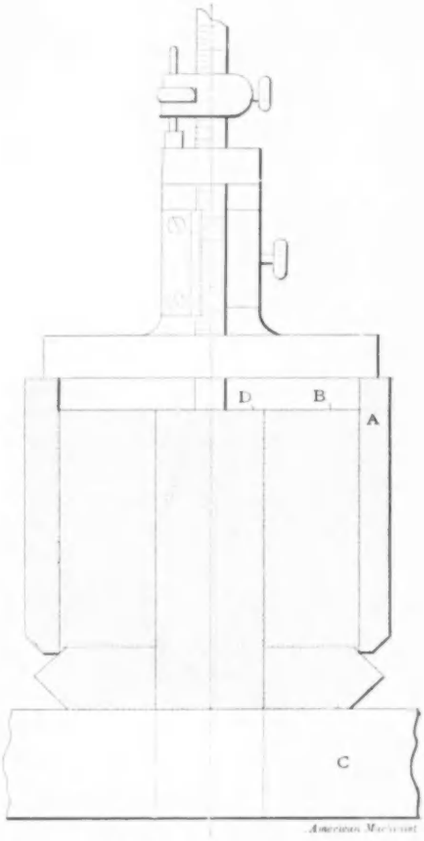


FIG. 4. THE MEASURING DEVICE AS FINALLY MADE.

To overcome this inaccuracy we made over and added to the measuring rig, so as to look like Fig. 4. Using the same outside ring A, we made another inside ring B, the hole in which was lapped to the size of the hole in the cutters. We then made a base

plate *C*, in which was fitted a standard *D*, square with the plate. The cutter to be measured is slipped over the standard, followed by the rings, and the depth gage is applied as shown in Fig. 4, measuring to the top of the inner ring (instead of down to the cutter as in Fig. 2), which is necessary because the inside ring fills the space between the outside ring and the standard. By thus holding the rings to the center on which the cutter rotates when working, the outside ring gages from the highest teeth. These teeth perform the work and therefore form the proper gage point.

A pair of cutters measured in this way, if mounted in the milling machine on a true and properly fitting arbor, will cut grooves exactly alike.

This method of gaging is not confined to cutters of this particular shape and angle, but may be used for gaging any ordinary angle cutter when it is required to have two or more cut alike or to have one cutter ground alike on both sides. It might be necessary on account of too great variation in diameter of cutters to have two sets of rings, and if the holes in the cutters were of different sizes, to make several standards for the base plate, or one standard for the smallest hole and bushings for the larger sizes.

HORACE E. HEXT.

Grand Rapids, Mich.

Wants Information about Drilling Glass.

Editor American Machinist:

I would like to ask your readers who have experience in that line of work for a few points on drilling glass. I have done more or less of it, drilling small holes with flat or twist drills and larger ones with brass tubes and emery, but there must be a certain grade of emery which is best and other points that would not be liable to occur to one who has done but little of it. CORNEIL RIDDERHOF.

Advantage Resulting from a Slight Change in Making a Pattern—Simple Clutch for Small Shaft.

Editor American Machinist:

Some machinists expend $10 worth of "gray matter," $5 worth of draftsman's and patternmakers' time and $2 worth of material and miscellaneous labor, in getting up a job that has a cash salable value of $7.50. Others do not consider it worth while to work for their health. The shops of these latter abound in "kinks" that are making money for themselves and other people. The Straight Line Engine Company believe in having as many "wrinkles" as possible in their shops, and in consequence as few as possible on their faces.

For instance, in making the patterns for the arms of pulleys and gears, it is customary to use pieces only as wide as shown in Fig. 1. They are troublesome to work, and the pieces at *a* chip off. Like Fig. 2, with the pieces wider, seems to Professor Sweet to be the right way.

Again, the problem presents itself of making cheaply and effectively a clutch drive between two shafts, each about ⅞ inch in diameter, which are to clutch together under motion. They are light, and are to have no work on them when the clutch takes hold. Cheapness is an essential. Two milling cuts with the same setting, only rolling the shaft over, as in Fig. 3, do the business. ROBERT GRIMSHAW.

Dresden, Germany.

An Emergent Gear Casting Trick.

Editor American Machinist:

I have the pleasure to offer a description of an extemporized spur gear which may come handy to some of your readers who cannot or do not care to cut a fine gear. I have found it specially valuable where a gear with an unusual number of teeth has been required for cutting fractional threads. The method is to set two gears (of the same pitch as the desired gear) sufficiently far out of mesh to allow a thin strip of copper, or, better, of tin plate, to pass through, thus corrugating it. Count off as many corrugations as the number of teeth wanted in the gear, and two or three extra for overlapping. Chuck a block of cast iron and bore a recess therein of diameter and depth sufficient to contain this corr gated ring. Lay the chuck down flat, still holding this recessed piece; put in the corrugated ring, and pour babbitt or lead therein, thus forming the teeth. Before removing the gear from the mold screw the chuck back on the lathe spindle and bore the gear as desired. If a strip of tin has been used, the lead will invariably solder itself thereto, and the iron facing will wear a long time. If these directions are neatly carried out, a surprisingly accurate gear will be obtained. F. JOS. LAMB.

An Arbor for Taper Grinding.

Editor American Machinist:

Anyone who has had occasion to grind large numbers of angular pieces by means of an arbor revolving on centers in a small tool grinder will not need to be told the reason for placing this job on a larger machine.

In Fig. 1 side and end views of a cast-iron dial for milling machines are shown, which were turned on turret lathes and hand-reamed before grinding. Grinding was desirable, as by this means a good, cheap finish and uniformity of angles and concentricity with the hole could be secured.

We made an arbor, Fig. 2, to fit closely to spindle of swiveling head of universal grinder, and having three tapered adjust-

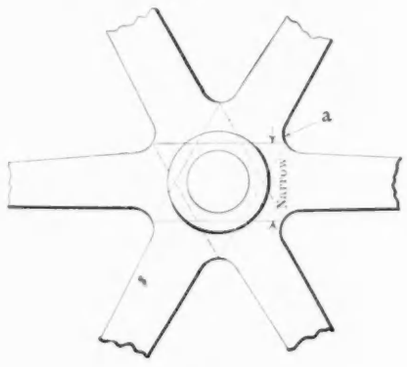


Fig. 1

Fig. 2

Fig. 3

TWO WAYS OF MAKING A SPIDER FOR A WHEEL PATTERN—CLUTCHING A SMALL SHAFT.

able blades dovetailed into it; two of them a tight fit and one sliding, as shown separately in Fig. 3. The loose blade differs from remaining two only in that it has an L-shaped projection at inner or thin end.

In Fig. 4 is shown an auxiliary arbor, used only in setting machine. In operation this arbor was placed in the spindle of the head and ground and measured until, by swinging platen in and out, measurements showed the machine to be grinding true or straight, when it was removed and Fig. 2 inserted and ground to size by using one of the dials to be ground as a ring gage. During this grinding the sliding blade was held in position by the two cheese-head screws shown. When the head was swung to the grinding angle these screws were loosened.

The idea was to have the work push the sliding blade before it by means of its projection until by sliding forward it moved

outward to engage with hole in work, which would then be held by friction. I was strongly tempted (and probably succumbed) to use language "more forceful than elegant" when I found the operator, after having been very thoroughly instructed to the contrary, using it in a very different manner from the one intended. He had simply allowed the screws and sliding blade to remain fast and was "ringing" (past tense probably "wrung"; see "chicken" and "neck") the dials on with a twisting motion of the hand.

If I now had another to make I would make it as in Fig. 5, having all blades a tight driving fit and dispensing with the auxiliary arbor. It should be explained that the blades must be adjustable to allow of setting out for the grinding which is always necessary when setting up a job of this kind, as it is impossible to remove and replace such an arbor without disturbing the relation of its circumference to the center about which it revolves.

A. B. CHRISTMAN.

Castings, Bad and Good.

Editor American Machinist:

Chemistry is known as an exact science; molding is also a science, known exactly for what it is—a very inexact one, due largely to the innate cussedness of patternmaker and molder, ably assisted by the party intrusted with the mixing and melting of the metal.

First and foremost, as to the patternmaker, is the element of contraction, which he is supposed to keep on tap, subject to the necessities of each case, and to apply correctly, when in reality so many shops have such different ideas—good, bad and fierce—on shrinkage, which the men working from shop to shop seem to absorb, until the whole becomes a tangled mass, useless and inextricable for all practical purposes. Set rules for contraction can never be successful, because of constantly changing conditions; and to see a patternmaker use his "tenth rule" (1-10 inch to 1 foot) on patterns to be cast in steel, iron, aluminum and the several alloys, with a free and untrammeled hand regardless of consequences, is not an inspiring, yet is a very common, sight; for it seems that all metals look alike to him, and the important item of allowing proper shrinkage for each is too insignificant to be thought of.

The molder, in turn, is not entirely blameless by any means, as, granted that the pattern be perfect, the ethics of his trade demand that after "ramming up" he must jab his "vent" wire into the pattern in several places with an X-ray precision of aim that is often disastrous to sharp corners, bosses, ribs, etc.; and if there is enough left of the pattern after "turning over," he sticks his rapping bar clean through it if possible (always using a bar of sufficient cross-section to lift and rap a pattern weighing as many tons as the one he is molding does ounces), and with a wicked gleam of satisfaction in his orbs, he adds his little mite to the length, breadth and depth thereof, limited only by surface conditions and his tired muscles; then he begins to "draw," touching at different spots on the way up and preparing for lumps on the casting. After the draw he starts in to improve (?) the shape of his mold with tools that seldom fit the spots he thinks need touching up, and having satisfied himself that everything is lovely he begins "blackleading" with a coarse brush or his mighty paw. All these little practices of his result in a casting that is seldom true to the pattern.

Now for the party that mixes and melts the "soup." In the average jobbing iron foundry it is usual for the foreman to oversee the mixing, using certain proportions and kinds of pig and scrap to make soft, medium and hard mixtures, and that he can come pretty near getting these results I do not deny; but by taking a little more care and using the system in vogue at a foundry here in my little town, a greater degree of accuracy will result every time.

I refer to what we call the "cooking process," when accurate castings are wanted and when people are willing to pay a slight extra charge for them, as it involves additional expense, due to melting the iron in a cupola and then "cooking" it in a natural draft furnace for from one to two hours, according to quality. The advantage of this system over the old "happy go lucky" way is, that, with a known mixture of iron poured at the right

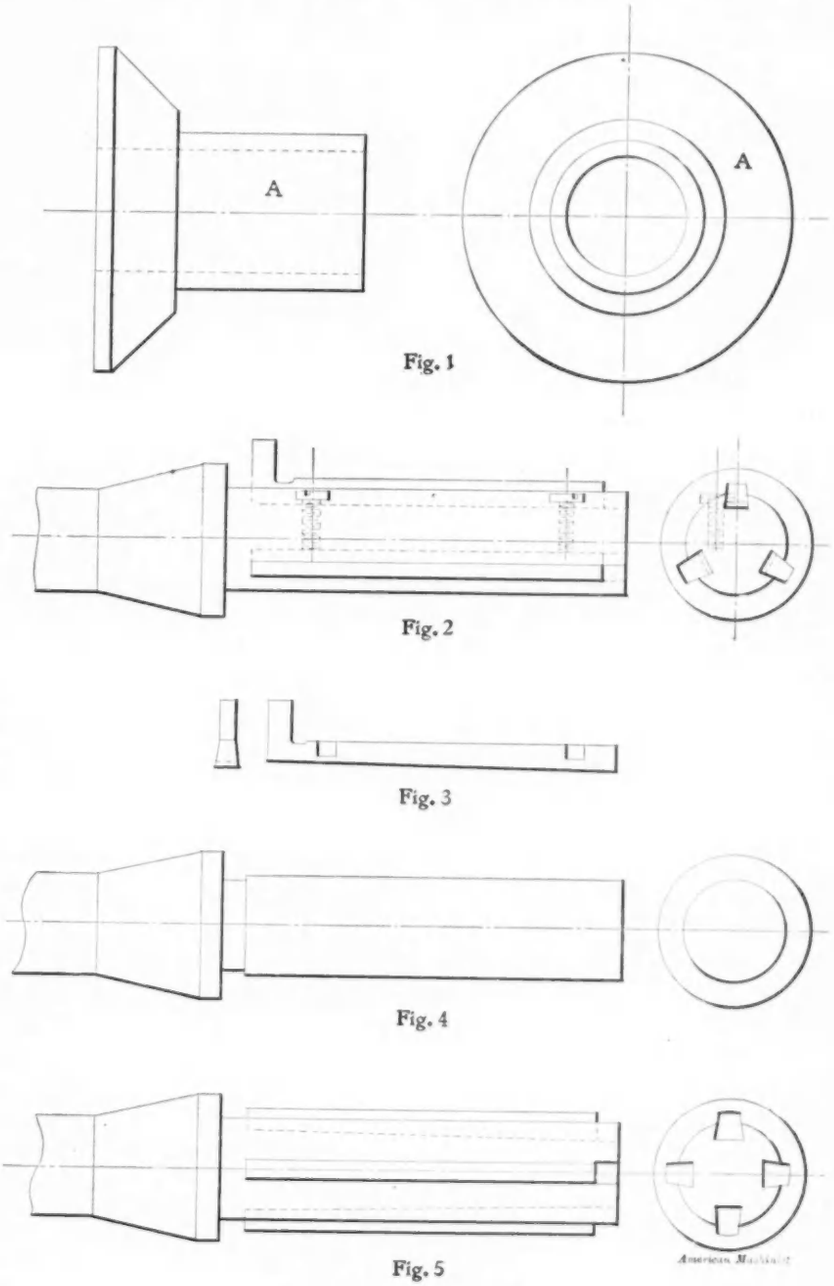


Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

ARBORS FOR TAPER GRINDING.

temperature, and with sand properly tempered by actual test for moistness, the pattern *vibrated*, not rapped, by a little device that has been on the market for some time and which can be attached to any pattern and you will get castings that do not vary 1-64 inch to the foot, and that ought to be good enough for anybody.

I might mention here that it is customary with us to take out of the cupola only the amount needed for the "cooking" process, leaving the rest for castings in which no great degree of accuracy or purity is desired.

Having experienced these little things, it strikes me that the deductions are plain to any observant and interested party, and it's "up to" the firms and their superintendents to profit thereby; therefore it would be a good stroke of business to start the reform movement in the pattern shop, by buying as many sets of shrink rules, from 1-16 inch to 1 foot to 3/8 inch to 1 foot, advancing by sixteenths—preferably of steel—as you have men, and insist upon the use of the same on the different jobs which, in the judgment of the man in charge, they should be used on. While you're about it, just ask your boss patternmaker to tell his men to take their own shrink rules home and frame them, for they are undoubtedly entitled to that distinction from the amount of trouble and profanity they have caused in the past. Then go over to the foundry and whisper gently in the ear of the foreman that it would be a good idea to try the "cooking" process on your particular work, and that hereafter any molder caught rapping a nice, thin and delicate pattern with a large, fat bar, vigorously pounded by a 64-ounce "tack" hammer, will be presented with an honorable discharge and pensioned for life.

Then make a social call on your foreman machinist and tell him what you've done, and mention casually that there will not be many kicks coming from him in the future about poor and inaccurate castings, and under the new order of things you will expect him to do work much faster and better, now that the castings are to come so nice. He probably will curse you behind your back, but that's only his way of appreciating your efforts, and he will be compelled to admit that the Old Man was right and knew a good thing when he saw it. "Old Bob."

Adaptable Counterbores.

Editor American Machinist:

In trying to find a substitute for the solid counterbores used in our turret machines, we designed the form of tool shown in Fig. 1, which proved so satisfactory for inside work, that we decided to try a tool of similar construction for outside work. This has also been found to be a very servicable tool and a cost-cutter.

The body of the counterbore, Fig. 2, may be of cast iron or steel. The cutters are made of Mushet steel, which comes in bars; 3/8x1 inch, 3/8x3/8 inch and 1/2x1/2 inch, being the most common sizes kept in stock. The surface *C* is 1-32 inch below the center line. The faces of the cutters being on the center line, there is a projection of 1-32 inch above the surface *C*, giving the clamp a chance for a firm hold upon each piece. The clamps, cut from cold rolled steel stock, 3/8x1 inch, are held in place by 7-16 inch cap screws with 3/4-inch collars. On the opposite side the tools are made of Mushet steel, which comes 1-32 inch above the surface *A*; *F* being also 1-32 inch above *A* it forms a purchase for the clamp. Surface B is 5/8 inch below the center line, to allow plenty of room for turning the adjusting screws. Recesses *R* are clearance spaces for the shaper tool. These tools should always be fitted with some kind of a pilot, to insure perfect alinement. The pilot *P* is of counterbore form and cuts its own way, is made of tool steel, hardened and ground. *S* is a hardened steel sleeve, fitted over the casting and ground true. It is always best to have two of these tools for the work, one rougher and one finisher.

The outside tool shown in Fig. 2 is of similar construction. The body is of cast iron or steel, with inserted cutters of Mushet steel. A blind pilot is used in this case, made of machinery steel, hardened and ground. The construction of these tools is comparatively simple, the grooves for the cutters, the hole for the pilot and the shank fitted to the turret, being the only finishing necessary. When once made they are adjustable, and practically indestructible, as the cutters are easily replaced when worn. The grooves for the cutters should show in the casting (finish allowed), for with the angle given on the drawing, their position may be obtained accurately enough without much laying out. S. B.

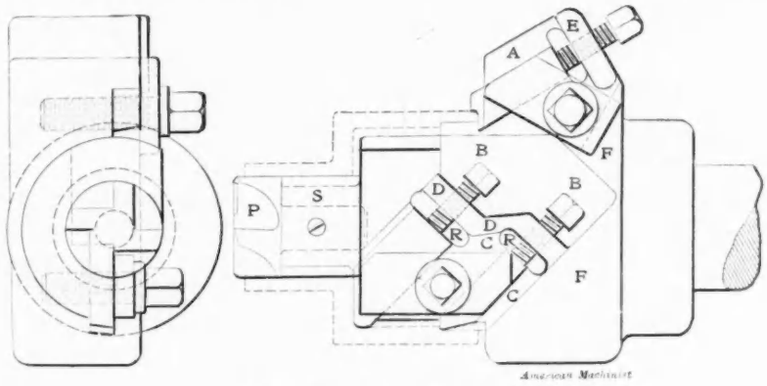


FIG. 1. A MALE COUNTERBORE.

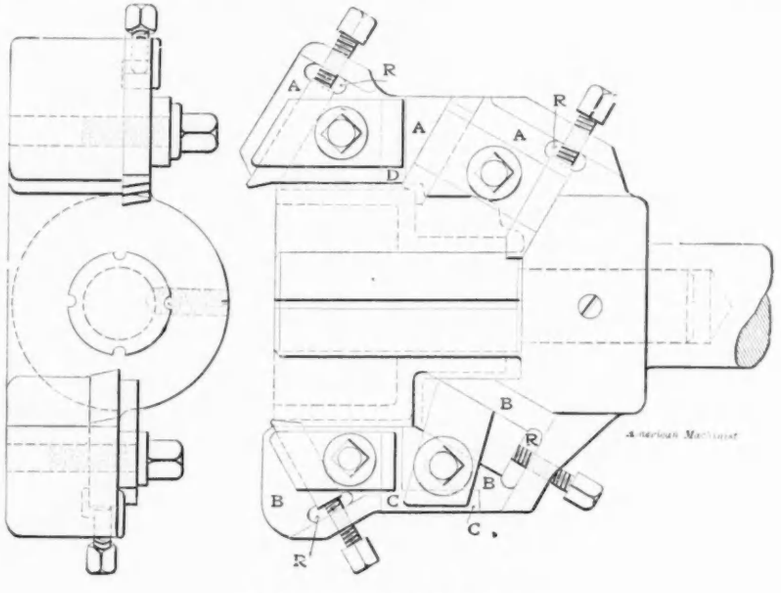


FIG. 2. A FEMALE COUNTERBORE.

Making an Accurate Ellipse.

Editor American Machinist:

Somebody was asking for a method of obtaining a templet of an ellipse and believing that he wanted something more than a mere schoolboy answer, I send the following plan, knowing that it will with care produce first-class results.

The first step will be to have made or obtain a cylinder of brass; if cast to be

shaped like Fig. 1 and of sufficient length to produce the ellipse wanted. Bore out in chuck to a smooth finish to a diameter equal to least diameter of ellipse. True up the outside, then face the beveled end of the cylinder to a nice true plane of an ellipse, the least diameter of the ellipse being the diameter of the cylinder at right angle to the axis and the greatest being the length of ellipse desired. Draw a line

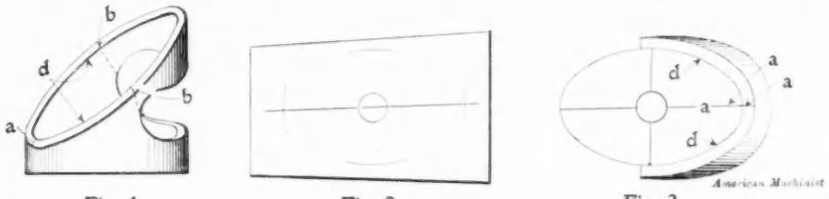


Fig. 1 Fig. 2 Fig. 3

MAKING AN ELLIPTICAL TEMPLET.

through center of plane, as shown at *a*, then cut off piece through dotted lines *b* and we have something like a master templet of an ellipse.

Now take a piece of sheet steel 1-16 inch thick—draw lines on it at right angles and strike arcs of circles, as in Fig. 2, and prick punch as shown. It is now an easy matter to lay off the ellipse with the aid of punch marks and our master-templet. Carefully cut out near the lines, then fit to edge *d* of templet, always keeping line *a* of piece we are working on even with that on templet, as in Fig. 3. If the work is carefully and faithfully done the result will be the most perfect form of templet of an ellipse that I know anything of.

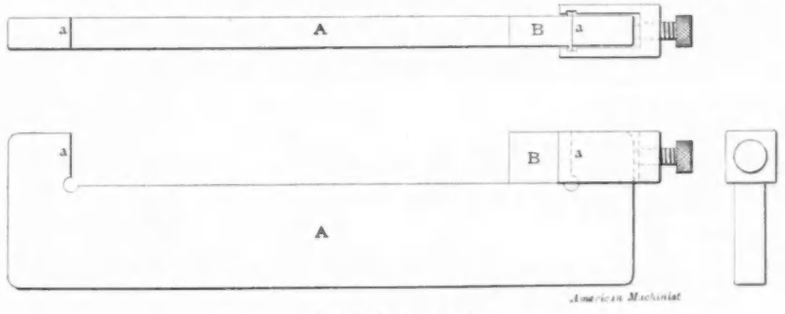
It may be desired to produce the female form of ellipse; if so, we must go a step beyond. Taking a piece of the same material as the last templet we can very quickly scribe the form of the ellipse with the aid of our finished templet, and then work carefully to fit our second templet to the first one. It is a most painstaking job, but it can be done with the necessary skill.

FRANK RATTEK.

A Set of Shop Gages.

Editor American Machinist:

The sketch shows a plan adopted to provide an equipment of gages for end



A SET OF SHOP GAGES.

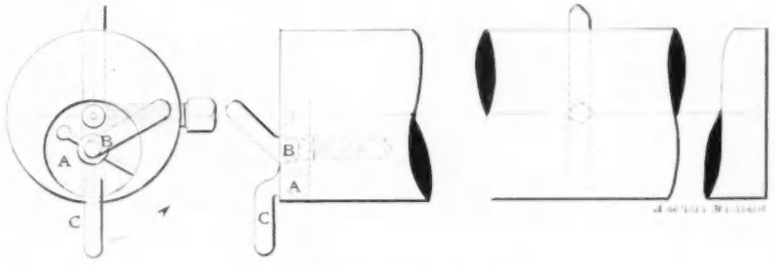
measurement. Outside gages *A* were made in exact inches between the shoulders *a a*, and the blocks *B*, of which there were two sets made, included sizes from ⅛ to 15-16 inch by sixteenths, and one 1 1-16 inch block. The latter was used in place of a 1-16 inch block, which would have been too thin to hold with the clamp as made. Male gages to correspond were made of square steel and ground to length after hardening. By this method a large range of accurate gages was available at a comparatively small cost.

W. R. G.

Adjustment for Boring Bar Cutters.

Editor American Machinist:

The sketch shows a boring bar device by which it is possible to change the cut of the tool so that it will bore larger or smaller. The end of the bar is recessed and the split disk *A* is sunk into it, as shown. The screw *B* with the taper head



A BORING BAR ADJUSTMENT.

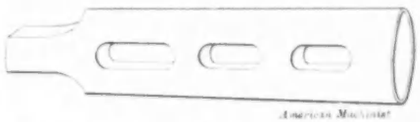
when screwed down tight distends the disk and fastens it securely in the end of the bar. The center for the bar is in this disk as shown. With the disk in the position shown the center is in the center of the bar, but if the disk is turned in the bar the center becomes eccentric and the cutting point is of course carried outward so that it will bore larger. This arrangement is of course only used for minute adjustments, as, if much difference is required, the set-screw may be slacked and the cutter moved in or out, as required, and tightened again. If the cutter is at the middle of the bar the movement of the center in the disk of course produces only one half as much movement of the cutter point. The handle or tail *C* of the disk is a convenience in turning it. The device is easily operated by one who is accustomed to it.

C. W. PUTNAM.

Slotting Taper Drill Sleeves for Convenience in Changing Drills.

Editor American Machinist:

To save time in changing drills where two or three sockets or taper sleeves had



MAKING TAPER DRILL SLEEVES HANDIER.

to be used, I took the larger ones and made additional slots in them like the sketch, so that the drill could be taken out without having to take out the sockets one after the other to get at the holes, thus saving two or three operations every time. I simply noted the positions of the slots in Nos. 1 and 2 and cut them out to correspond in Nos. 2 and 3. There is enough stock left between the slots to leave sufficient strength in the sockets.

R. LACHMANN.

Expanding Cutter for Boring Bars.

Editor American Machinist:

Probably many of your readers will be interested in the description and sketches of an expanding cutter—being an improvement over the usual solid cutter and shell reamer for boring bars—which has proved very satisfactory in actual practice. The designer of it, Mr. John Hoerner, foreman at the Niles Tool Works, explains it thus: "Necessity, the mother of invention, led me to try this plan. I was having no end of trouble with some hard brass castings which were wearing out the shell reamers very quickly. These reamers are not easily replaced, being expensive to reproduce or purchase. My first plan was to make a cutter, as in Fig. 1, with T-shaped slot and to force expansion by means of a cone end screw. The toolroom had its misgivings as to the results, but it was at once a success and easily displaced the

shell reamers, etc. I then had a complete set of them made with hole and slot, as shown in Fig. 2.

"Figs. 3 and 4 show the application of the expanding cone and screw. It will be seen in Fig. 3 that for vertical bars the expansion screw is also used for holding the cutter in its place in the bar, while in Fig. 4, for horizontal bars, two screws are necessary, one each for holding and expanding. These can be easily arranged.

"The cutters are marked *S*, being scant size when not in use. The actual size is obtained by applying the expanding screw. In operation, with a number of pieces to be bored, the first one is made to the gage

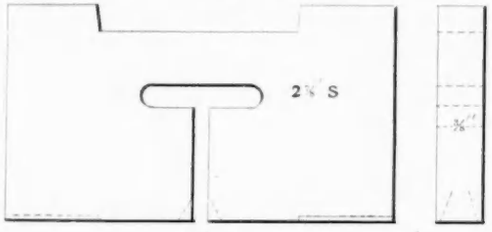


Fig. 1

Details of Cutter

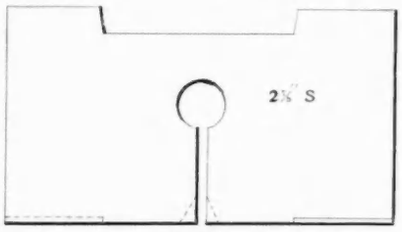
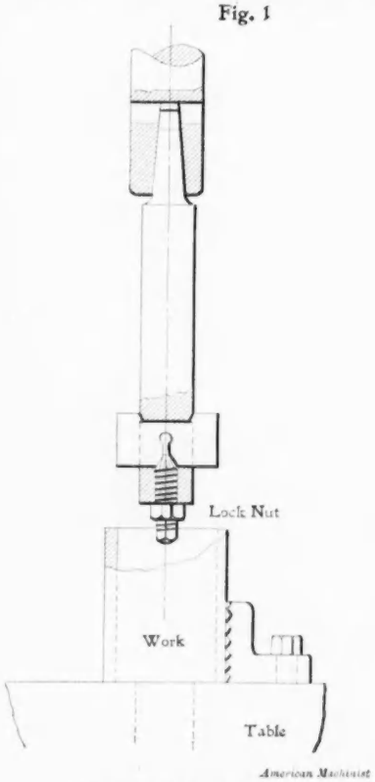
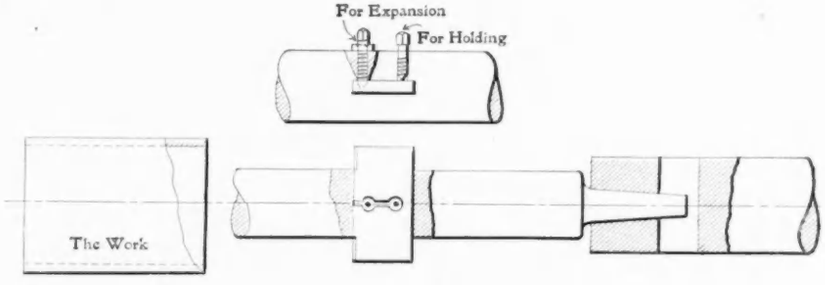


Fig. 2



Vertical Boring Mill

Fig. 3



The Horizontal Boring Machine

Fig. 4

EXPANSION CUTTER FOR BORING BARS.

in two or three cuts through, after which the gage may be tried about every sixth or eighth piece, giving a slight expansion as the wear occurs. It is clearly seen that this convenience is impossible with the shell reamers or the solid cutters, which must be set aside as they wear under size."

Mr. Hoerner is, and has been for many years, an interested reader of the "American Machinist" and appreciates the many good pointers obtained from its pages, and therefore feels a pleasure in giving to your readers what is apparently a good thing. WM. PILTON.

Suggestions in Practical Lathe Work.

Editor American Machinist:

I have some shafts to turn, which are 27 feet long, and the longest lathe is only 23 feet between centers; the question arises how to do it. I had some shafts to turn some time ago in a lathe which would take in 6 feet, and they were 8 feet long. We chucked one end and put on a collar which ran in a steady-rest near the other end of the lathe, the collar or sleeve having eight screws for adjustment, four on each end. This collar must be stiff enough so that it will not spring out of true. It is well to ease it up before the finish cut, as, if the collar is not round, its error will be reproduced in the shaft. When ready to turn the shaft, just true up a place on it near the steady-rest, a little wider than the jaws, get this spot round and smooth and then dispense with the collar. Rough-turn the shaft between the chuck and the steady-rest, reverse the shaft and rough turn and finish that end, then again reverse and finish the other end, cutting off the end that is held in the chuck; or, if the shaft will not allow this, grip the shaft with as little in the chuck as will drive it. Where the shaft is much reduced in diameter—say, ½ inch on a side, or 1 inch in diameter—you can cut under and leave very little to chip and file.

In chucking shafts such as this, it is not good practice to grip more in the chuck than about ¾ inch, so that the jaws will not spring the work. This relates, however, only to small diameters, from about 2 inches down. This applies in centering any work when one end is held in the chuck and the other end in the steady-rest, especially when the piece is short and of large diameter, say above 3 inches and about 12 inches long.

While thinking just now about steady-rests, I have watched a good many men set a steady-rest, but very few make any use of the pitch of the thread in the steady-rest screws. For instance, if your tail spindle is 2 inches diameter, your work 3¼ inches and the steady-rest screws 8 threads to the inch, set the steady-rest first with the jaws all touching the tail spindle, then back them out 4½ turns, or say 5 turns, and come forward ½ turn, to take up the slack in the screw, making 4½ turns; this will give the 3¼ inches diameter. If then you should wish to enlarge to 4¼, simply back your screws 4 turns each, taking up the slack afterwards. Any other diameter can be had in the same manner very quickly.

Another kink that I find useful in chucking work is to always work the opposite jaws on a four-jaw chuck together. Get two jaws nearly right, then get the other two just right, and reset the first two just right. I find it a convenience, when doing this, to interpose a piece of material, say ½ or 1 inch, between a tool held in tool-post and the work; this allows the high spot to clear the tool. The beauty of this method is that you know just how much it is out, and can move the screw to suit. The old way of chalking will show the high place, but will not tell how much it is out, besides losing time in starting and stopping the machine every time. Then, again, sometimes there is a lump on the casting, and then you cannot use the chalk anyway.

If I have a piece to rechuck which has been turned, I rub chalk on four spots at

the jaws and use a fine-pointed tool that will just make a line on the chalk; this of course is in the absence of an indicator. These few last kinks are so simple that I would not mention them, but for the fact that nine out of ten men—yes, I may say ninety-nine out of 100 men—I have met use the old chalk way. Disconnect the cone from the spindle when setting work of this kind, unless it is much out of balance and you must use the back gears to hold it.

Another simple thing which is little practiced is in taking off and putting on chucks, say on lathes up to 24 inches swing. In putting on the chuck do not have the back gears in, as your spindle moves too slowly and you get tired holding the chuck; the same applies in removing the chuck.

Another little wrinkle is in square centering work. I have seen a great deal of this work done, and most men seem to think that the square center must be the same angle as the center, and they spend a great deal of time trying to grind it to that angle, which is a waste of time. The square center, as I use it, may have any angle from 60 to 90 degrees, since I use it to simply locate the center properly and nothing more, as the drill and center reamer do the rest of it.

Another little wrinkle was born the other day that may be useful to others. I had some internal gears to cut, 10 inches pitch diameter and 1¾-inch face, 60 teeth. The time taken to cut the teeth was two hours on a Gould & Eberhardt 24-inch shaper. The method pursued was first to draw a fine line on the periphery and with dividers lay out the 60 divisions. The next operation was cutting the teeth. This was done by fastening on the center that belongs to the stationary part of the vise of the shaper and clamping another similar piece on the top of the vise and to one side. This formed two points for the ring to rest on, a part extending down into the vise jaws. A pointer was clamped on one side and one of the division lines was brought in line with it, the vise closed tight, and all was ready. At first I stopped the machine to turn the gear for every tooth, but after cutting one-half of one wheel I found it was not necessary to do this; with one hand on the wheel to bring it to the line and the other on the vise lever, it is an easy matter to do the job. This gear work is not as accurate as when done on a dividing head, but it answered the purpose. A. MERTES.

Emsworth, Pa.

Automatic Lathe Reversing Attachment.

Editor American Machinist:

While foreman of a machine shop I had to make several pieces, as shown at Fig. 1 of the accompanying sketch. They were of machinery steel, had to be to gage and interchangeable—quite a particular job. The shop had several lathes, planers, boring machines and two small milling machines. It seemed a hard task to do the job with the machines at hand, for the hub at *A* prevented the turning of the outside, and I was perplexed for a while. After a little thinking, however, I suggested the making of an attachment to automatically reverse the motion of a suitable lathe. I had the attachment made and it worked most successfully. It is illustrated in Fig. 2. *N* is a standard bolted on the bed of the lathe, *C* a lever pivoted on this piece, *D* a rod connected to the bell crank *E*, which is connected to the shipper bar. The bell-crank is placed on a piece of beam screwed to the ceiling; a weight *W* is attached to the bell-crank, as shown. The action of the attachment is readily understood. The levers are shown in their central positions with the belts *F* and *G* on the loose pulleys. Moving the lever *C*, the bell-crank *E* moves with it and causes one belt to be thrown on the tight pulley. The machine starts and runs in one direction until one of the straps *H*, bolted on the face plate moves the lever *C*, shifting the belts and changing the direction of rotation of the lathe. The straps *H* may be shifted and adjusted to the right point. The weight *W* when thrown either way corrects the tendency of the belts to return to their former places.

The pieces were faced at *P*, Fig. 1, and bored and then milled at *K*, 2½ and 3¾ inches respectively from the inside of the hole, and concentric with the hole. A heavy ring was made 24 inches in diameter and fastened to the face-plate. The pieces were put on this ring, strapped at *S*, and side *R* was faced. They were then strapped at *R* and the reversing attachment was used, cuts starting and finishing at the parts previously milled.

The tool used is shown at Fig. 3. A tool is fitted in a slot, its end rounded as shown and free to turn on the pin *Y*. A spring *x* helps to raise the tool when the motion of the lathe is reversed; the tool returning to position when the next cut

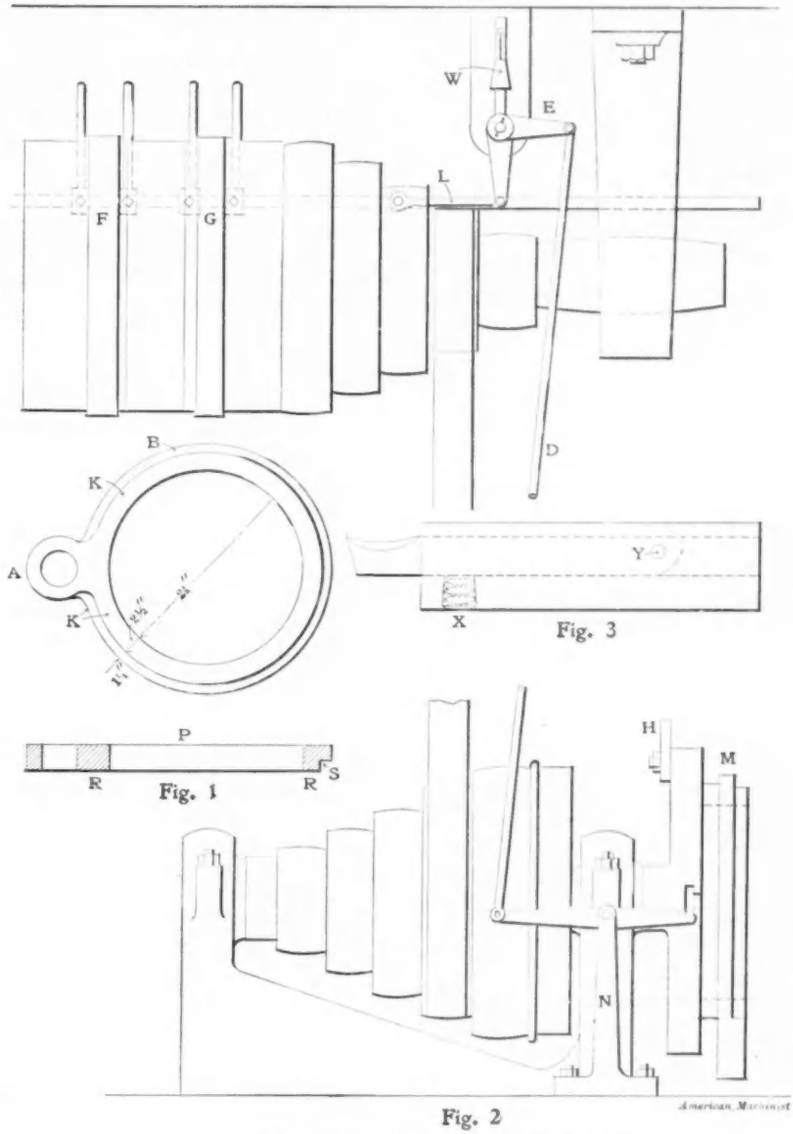


Fig. 3

Fig. 1

Fig. 2

AUTOMATIC LATHE REVERSING ATTACHMENT.

begins. This job was very neatly and exactly done, and the time was remarkably short. The attachment was roughly forged, and the expenses were light.

J. M.

Turning Eccentric Brass Boxes—Calipering for Press Fits—Feed for Compound Rest.

Editor American Machinist:

Figs. 1 and 2 show a job of turning brass boxes to fit iron boxes, Fig. 3. These boxes were formerly made with the same thickness of metal on the bottom and at the sides. The wear was all on the bottom of the box, so it was thought there would be a saving by making the bottom of the brass thicker than the sides, as they could

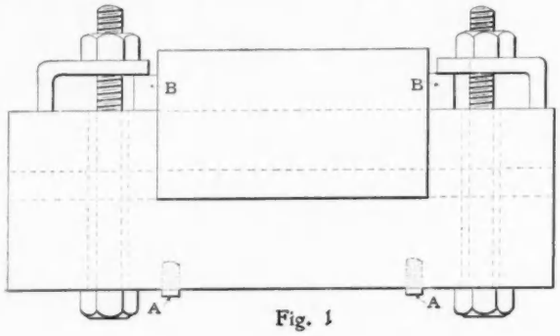


Fig. 1

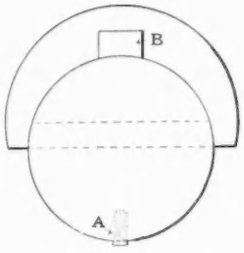


Fig. 2

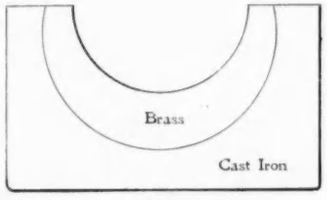


Fig. 3

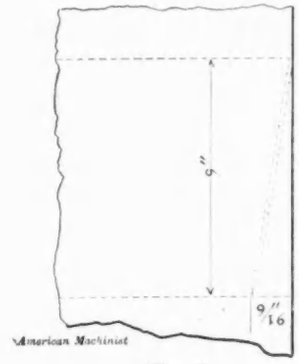


Fig. 4

TURNING ECCENTRIC BRASS BOXES.

then be refitted more before being worn out.

The brasses were first bored to size and then clamped on the mandrel, as shown, the centers of the mandrel being offset so as to make it a long eccentric. The lugs *B* were cast on the boxes for the straps to bear on and they were cut off after the turning. The brass plugs *A* located the points of the calipers right for measuring when turning.

A short time ago I saw in the "American Machinist" some talk on how to make press fits. Fig. 4 shows our way. For each inch in the diameter of the hole we incline the pin gage *C* 1-16 inch; thus, with Fig. 4 the bore is 9 inches, we incline the pin gage 9-16 inch, and then turn the shaft or crank pin the size of this gage.

I had a lot of crossheads to bore with a taper hole ¾ inch to the foot. My compound rest had no feed, and I did not like the idea of feeding by hand, so I got six grooved pulleys bored, one to fit the end of the feed rod, and this I cut a keyway in; another I cut a square hole in to fit the squared end of the screw on the compound rest. The other four I drilled 5-16 inch holes in and, with a heavy wire nail for each, I nailed them one on each side of two beams over the feed-rod pulley and over the compound rest pulley. I got some round belting from the storeroom and then I was ready for business. I got a very smooth hole with this rig. The "Old Man" came around after I got the rig working. He looked at it for about five minutes and then he walked away smiling.

JOB LATHE.

Uses of the Micrometer Caliper.

Editor American Machinist:

I have seen descriptions of some novel uses of the surface gage, combination square, hight gage, depth gage, universal center and surface tester and the inside caliper, but it seems that the most indispensable tool of all, the much-abused micrometer, does not get the attention it ought.

When I say abused, I mean it; for did I not catch a "know it all" using one for a C-clamp, and upon being asked he calmly answered that he could not get an ordinary clamp on that place; but he was not hurting it any, for he had only screwed it on lightly, etc., etc.; but by the shape of it it seems he must have used a Stillson wrench. At any rate, he never got a chance to abuse another tool in that shop.

We have all run up against the bluff who carries one or two and uses them for everything. When looking for a bar of stock or a piece of scrap he uses them; when going for a set-screw, bolt or machine screw the micrometer is applied; if he wants a twist or flat drill he fetches it along to measure them, and if you give him a job to turn the bearings on a wheelbarrow axle, he will use them on that, too. As to the character of his work—well, don't he carry a micrometer?

Then we've seen the really good mechanic trying to line up his centers so his lathe will turn parallel. He has taken a roughing cut over the stock and then a very fine cut. Before he has turned 8 inches he commences to gage it. He finds it .0015 or .002 inch taper, and the fun begins. He swings his tailstock over and tries again. Result: Continuous performance for several hours, a nearly spoiled job, and blessings for the fellow who turned the last taper in that lathe.

Now, it's far easier to make sure, by test or turning, that your live center is true, then turn one end of your stock to any old size (so long as it is above the finish), taking a light cut to insure its being round and true; then put any old tool into the tool-post with its back end to the work and clamp thereon the frame of your micrometer so that the spindle is horizontal and its center in line with the centers of your lathe. Put in the job with its turned end on the live center, run your saddle up so that the measuring screw (using it backwards with the ratchet stop or knurled end against your work) stops right on some line, then leave your cross-feed alone, using the micrometer screw only to pull away from the work. Now, by turning the work end for end and doing the stunt again, you can set your tailstock as accurately as it is possible, by simply moving over until the measuring screw stops at the same line. Care should be taken that the carriage is traveling in the same direction each time before measuring, and if you measure, say, within one-sixteenth of the end each time, you can swear by the job.

For testing a lathe to see whether its centers are the same hight the same system can be followed by using the micrometer backward from the top down or bottom up.

In a grinder it may be applied by holding the instrument between the collar on the spindle where the emery wheel usually is, and by blocking the spindle in any convenient manner; only, one thing must be remembered—all round or circular work has an error twice what your measurement will show. That is to say, if your centers would show only .0005 by the micrometer in your test, it will show .001 on your work. On straight surface work it shows the actual error at once.

This system can be applied to almost

any machine. On a planer, shaper or miller it works to perfection to detect any errors in the platen, vise or fixtures, and when it comes to line up a job to some finished surface in any machine, such as an angle-plate, V-blocks or some finished machine part, it's as good as a surface tester (a rare thing in toolrooms and among mechanics). It can be almost universally applied where very accurate work is an absolute necessity; yet I have seen but one man besides myself make this use of it. I've no doubt there are a good many more that know of it, but they seem to keep mighty quiet on the subject.

I might also add they can be used occasionally as an inside micrometer when they go into a hole comfortably. Only learn to read the graduations backwards and you'll be astonished why some maker has not allowed for this wrinkle by inserting a hardened piece on the end of your ratchet stop or barrel and adding a left-hand set of graduations which would in no way interfere with the other, as there is some space to let there.

L. O. WEYER.

[There is no doubt that the use of the micrometer for such purposes as those described by our correspondent is not practiced or appreciated as it should be. Our issues of March 3 and April 21, 1898, contain articles by Theo. H. Miller, in which many such uses are illustrated and described.—Ed.]

The Side Play of the Calipers.

Editor American Machinist:

Referring to the letter on page 497, "The Side Play of the Calipers," the following is an approximate rule for obtaining the variation in the size of a hole corresponding to a given amount of side play in the calipers. The rule has the merit of extreme simplicity and can be applied equally well to all diameters except the very smallest. In most cases the calculation is so simple that it can be done mentally without having recourse to pencil or paper.

Let

A = side play of calipers or end measuring rod *in sixteenths of an inch,*

B = dimensions to which calipers are set, or length of measuring rod *in inches,*

C = difference between diameter of hole and length of B *in thousandths of an inch;*

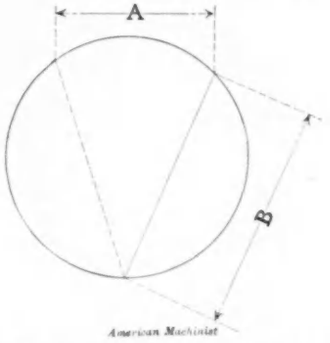
then $C = \frac{A^2}{2B}$, within a very small limit.

Example: A standard end measuring rod, 5½ inches long, has ⅜ inch of side play in a hole. What is the size of the hole? In this case $A = 6$ and $B = 5\frac{1}{2}$. Applying the above formula:

$$C = \frac{6 \times 6}{11} = \frac{36}{11} = 3.27$$

thousandths of an inch, or .00327 inch. The diameter of the hole, therefore, is 5½ + .00327, or 5.50327. The method will be found to be correct within a limit of about .0002 inch if the amount of side play is not more than one-eighth of the diameter of the hole for holes up to 6 inches diameter, within .0005 inch for holes from 6 inches up to 12 inches, and within .001 for holes from 12 inches up to 24 inches. If the amount of side play allowed be decreased the accuracy attained is very much greater. To secure the same limit of accuracy with larger holes the amount of side play proportionate to the size of the hole should be decreased. Generally, however, the limits of error allowable are greater in the case of large than of small holes, and the rule may therefore be said to hold good for all sizes of holes. For small differences between the length of the measuring rod and the holes the accuracy of the method is greater the larger the hole. For instance, an allowance of .001 inch on a hole 12 inches diameter requires about twice as much side play as in the case of a 6-inch hole.

This rule has been found to be useful for boring holes of large diameter in which allowances have to be made for running



THE SIDE PLAY OF THE CALIPERS.

or driving fits, as only a single measuring rod for each nominal size is required. The rods should be of standard length, or a known amount less than standard, the allowances being obtained by varying the amount of side play when boring. The rule is also capable of determining limits, as the maximum and minimum amount of side play allowable can be specified. The measuring rods should be tapered at each end and the points slightly rounded. For accurate work, the body of the rod should be encased in some non-conducting material to nullify the effect of the heat of the hand.

The geometry involved in this rule at first sight seems rather obscure, and will doubtless form an interesting problem for your readers. As a hint towards its solution it may be noted that $32 \times 32 = 1{,}024$, which does not differ by a very large amount from 1,000. The rule is only approximate and the errors increase with the amount of side play allowed. If used in the manner specified above, however, it is quite sufficiently accurate for most purposes. In internal grinding, when the hole is nearing the required size, an end measuring rod used in this manner forms a very handy method of ascertaining how much metal remains to be removed, and is much quicker than the internal micrometer. In comparing this method with that described by Morris Fulton in your issue above referred to, it should be remembered that the conditions are reversed—that is to say, Mr. Fulton's is a method for setting calipers to a given dimension *smaller* than a hole of known diameter, whereas the method now described is for boring a hole a given amount *larger* than a gage of known length.

In measuring the side play it is sufficient to take it to the nearest sixteenth of an inch, and if anything like accuracy is required it should be measured, not guessed at.

Attached hereto is a table giving the approximate results for a number of sizes, and in parallel columns those obtained by theoretical method. P. V. VERNON.

Coventry, England.

		Diameter of holes, inches	
Length of rod, inches	Side play, inches	Approximate method	Theoretical method
1½	⅛	1.5013	1.5013
1½	3-16	1.5030	1.5029
1½	¼	1.5053	1.5052
2	⅛	2.0010	2.0010
2	3-16	2.0022	2.0022
2	¼	2.0040	2.0040
2	5-16	2.0062	2.0061
3	⅛	3.0006	3.0006
3	¼	3.0026	3.0026
3	⅜	3.00600	3.00588
4	⅛	4.0005	4.0004
4	¼	4.0020	4.0019
4	⅜	4.0045	4.0044
4	½	4.00800	4.00783
6	¼	6.0013	6.0013
6	⅜	6.0030	6.0029
6	½	6.0053	6.0052
6	¾	6.0120	6.0117
9	¼	9.0008	9.0008
9	½	9.0035	9.0034
9	¾	9.0080	9.0078
9	1	9.0142	9.0139
12	⅜	12.0015	12.0014
12	¾	12.0060	12.0058
12	1	12.0106	12.0104
12	1½	12.0240	12.0235
18	½	18.0017	18.0017
18	1	18.0071	18.0069
18	1½	18.0160	18.0156
18	2¼	18.0360	18.0352
24	½	24.0013	24.0013
24	1	24.0053	24.0053
24	2	24.0213	24.0208
24	3	24.0480	24.0470

The Water Cut.

Editor American Machinist:

The question of the utility of the water cut on cast iron has been raised, and not having as yet noticed any answer to it, I would like to give some observations which I have made. In a railroad shop in the far West a large order of driving boxes of a special hard cast iron was sent through the shop. These driving boxes weighed about 300 pounds each, and to say that they were hard is stating the

truth very mildly indeed, for the planer, running 20 feet per minute, could not work those boxes at all economically, but with fine feeds, lots of attention and a vast amount of tool grinding, the job was finished. On soft boxes of the same type heavy feeds with little tool grinding was the usual order.

The value of the water cut on cast iron was demonstrated in a most remarkable manner in the first stage of the machining of these boxes on the slotter. The cutting speed on this machine was 17 feet per minute. The machinist who was first placed on this job was of the old school; he use water on cast iron? Not he! The time taken in finishing out the boxes on the slotter under a dry cut was from 8½ to 9 hours each, with lots of tool grinding thrown in. The management not being satisfied with the quality or the quantity of work turned out, the man on the job was taken off and a new and younger man just out of his time was placed on it. He started a soda-water cut and the results obtained by him were remarkable to all who had watched the progress of this particular job. The time taken on the second box was four hours and ten minutes, on the third box four hours, and on the balance of the order the time was kept under four hours. The boxes were carefully calipered after machining; those under the water cut were found practically perfect in all dimensions, but those cut dry, unless extra time had been taken to machine them carefully, were found badly out. The finished surfaces of the water cut boxes were smooth and beautiful to look at; those cut dry were rough to the touch. It is needless to say that the smooth boxes were better adapted to their purpose and thoroughly appreciated by all who had the further advancement of the finished job under hand.

FRANK RATTEK.

A Side Grooving Counterbore.

Editor American Machinist:

On page 322 of this year there appeared an article by Isaac Morgan describing a special tool for cutting grooves in a drilled hole for holding babbitt in place. This article brought to my mind a very useful tool similar to the one he describes, but for a different purpose. The tool shown in the drawing is a cutter bar used in a drill press for preparing holes drilled in valve faces for a special locking device.

There are a great many schemes for locking cheese-head screws in place by the use of a small screw, but none of them are reliable, for the locking screw is as apt to come out as the screw itself. This method of locking is shown in Fig. 2. A small hole is drilled half in the screw and half in the valve face. This is tapped and a brass dowel is screwed in. This makes a good lock, but is not reliable, and it is also very expensive to put in, especially where large marine engines are being erected.

There was a case of a large four-cylinder triple job being erected in these shops and all the cylinders of the two engines were fitted with slide valves. This meant altogether about 600 holes in the faces. The original design did not show any locking device for these screws, and when the engines were nearing completion the contracting parties decided that they wanted them locked in some manner. This

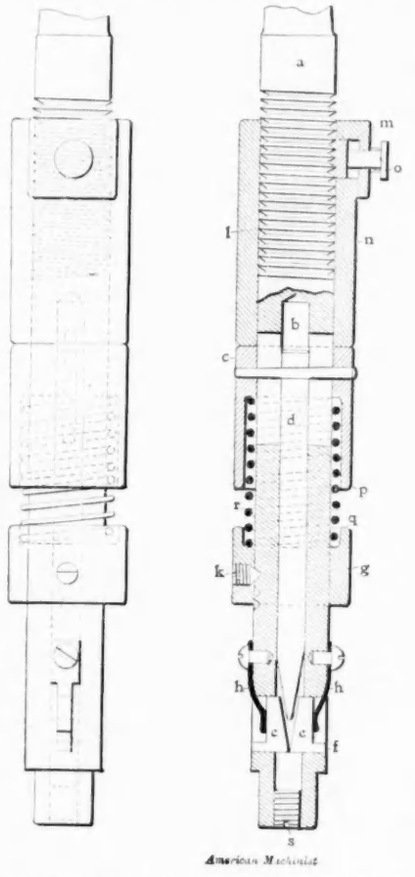


FIG. 1. SPECIAL TOOL FOR GROOVING SCREW HOLES.

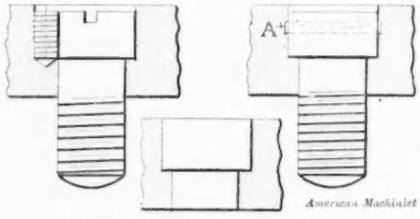


Fig. 2 Fig. 3 Fig. 4

WAYS OF FASTENING SCREWS.

was done as shown in Fig. 2. It took half a dozen men fully a month to ratchet and tap these holes, using special jigs for drilling. This was expensive, to say nothing of the drills and taps that were broken.

The experience gained from this job led to a demand for a quicker and cheaper method. After experimenting with different designs the one shown in Fig. 1 was decided to be the best. It is simple, quick and does not get out of order easily. The little cutters shown are made of hardened steel in large quantities, so it is only the work of a minute to slip the dull ones out and put in new. The valve face having been strapped level can be drilled, counterbored and fitted with grooves for locking the screws without resetting.

The holes are first drilled and counterbored as in Fig. 3. After the counterboring is completed the special cutter bar is placed in the drill spindle socket and puts in the little groove shown at *A* in Fig. 4. The groove is cut just so that the top of it comes in line with the bottom of the groove, or "nick," in the head of the screws. When the valve face is put in place and secured by the screws, then by pening with a blunt chisel in the slot in the head of the screw at both sides the metal is forced into the groove cut around the hole, thus forming a positive lock. To remove the screws, all that is necessary is to chip this small portion out of the groove.

All the parts of the tool are made of tool steel and hardened. The reduced portion on the end of the bar is the same diameter as the body of the screws. This acts as a guide for the bar. The diameter of the bar is 1-16 inch less than the diameter of the head of the screw, allowing clearance all around for the fine dust that accumulates while in operation, to be blown out by an air blast.

A hole *b* is drilled up through the center of the bar and a sliding pin *d* is inserted, at the top of which a small tapered pin connects it with the sliding collar *c*. The other end of the pin is tapered as shown to suit the bevel on the backs of the cutters *e e*. These cutters are held back in the bar by the two flat steel springs *h h*, fastened by screws to the side of the bar. The spring *r* keeps the pin *d* disengaged from the cutters, insuring their return into the bar when the collar *n* is released.

The collar *g* acts as a sort of gage. By setting the screw *k* in the different holes drilled in the side of the bar any depth of slot may be obtained.

The bar is lowered into the hole and the spindle of the press is locked endwise; then the small pin *o* in the loose collar *n* is pressed, and at the same time the collar is grasped and held from turning until the groove is finished. When this pin *o* is pressed it engages the thread cut on the bar (which is a left-hand thread). This feeds collar *n* downward carrying with it collar *g*, which has the pin *d* fastened to it. The taper at the end of the pin *d* being forced between the cutters *e e* pushes them out and cuts the groove. It is allowed to feed down until the shoulder *p* reaches the shoulder *q* on the two collars *c* and *g*. The pin *o* is then released, thus disengaging the thread on the bar, and the spring *r* forces the collars *c* and *n* upward carrying the pin *d*, and this in turn removes the pressure from the backs of the cutters, and the springs *h h* push them back into the bar. The bar can then

be lifted from the hole and is ready for the next. All these operations are done while the spindle is in motion. This tool has been found very satisfactory in these shops, and all large slide valves turned out since its adoption have been treated in this manner. C. V. L.

Union Iron Works, San Francisco.

Milling Machine Appurtenances.

Editor American Machinist:

One of the most enterprising concerns in this country for years, by advertising, persuasion, precept and example, exhorted

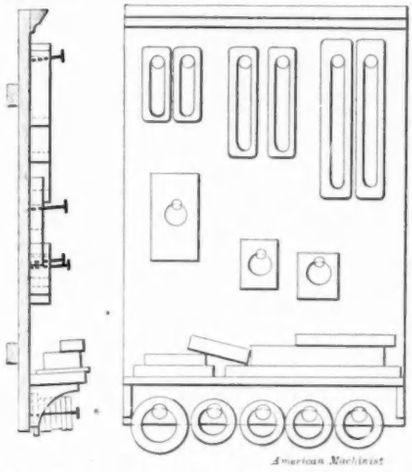


FIG. 1. RACK FOR MILLING MACHINE APPURTENANCES.

proprietors and managers of businesses to "stop the leaks." It seems as though all of us, each in his own way, are trying to heed the admonition. The shortest and most effective way is to plug the hole.

One of the most annoying leaks with us on our milling job was the hunting for bolts, washers, nuts, parallels, clamps, blocking pieces, etc., and this is how we plugged it. Fig. 1 shows a wall board or rack of which a number were made and fixed to the wall between the windows in a line with the machines. All loose accessories except wrenches, etc., were hung upon nails or laid upon inclined shelf as shown. Dimensions, about 28x36 inches.

Fig. 2 shows a cabinet of light galvanized iron with inclined shelves and drip pan and cleats. All drip pans, tanks and greasy articles generally were placed on the lower shelves to await the convenience of the man whose business it was to keep the job clean, and he distributed them to the wall boards or placed them on the upper shelf or on top. The cabinet is about 16x24x36 inches and the drip pan slightly larger.

Though we almost always found trouble in finding enough accessories to set up a job with before, after these appliances were in use there was found to have been almost enough of them to supply another set of machines. The trouble had been that each man had had "his own," and only loaned them as a favor or under compulsion. A. B. CHRISTMAN.

Cleveland, Ohio.

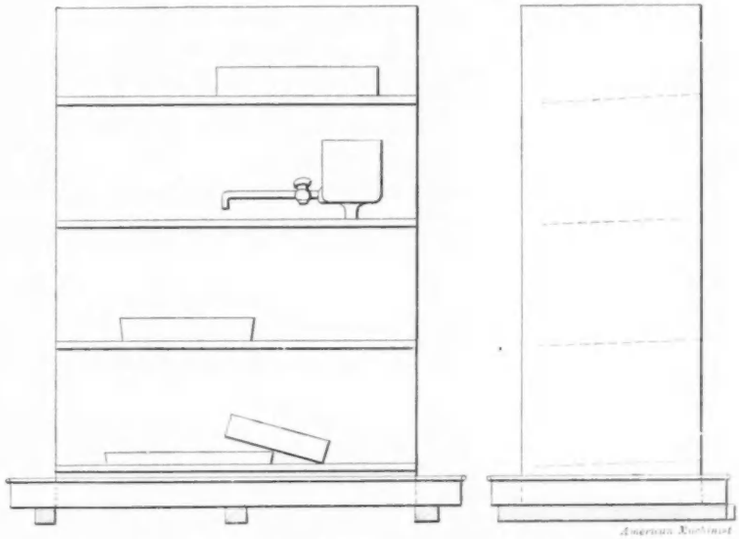
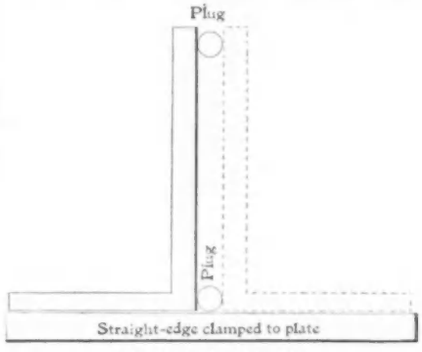


FIG. 2. GALVANIZED-IRON OIL-DRAINING CABINET.

Testing a Square.

Editor American Machinist:

The sketch shows a simple and easy way of testing a flat square, such as a carpenter's square, 24x16 inches. A good straight-edge is clamped upon a planer platen or a horizontal face-plate and one edge of the square is backed against it. Instead of drawing a line along edge *a*, I used two turned iron plugs of equal diameter. They happened to be 2 inches thick and 3 inches long. Those plugs were placed on the face-plate as shown. Guiding one edge of the square against the straight-edge, the other edge *a* is brought to bear against the two plugs, and to make sure of their bearing or contact the square and plugs are moved along together for a short distance, the square pushing the plugs. Then the square is backed and turned over and brought to approach the plugs from the other side (see dotted lines), close enough to try the touch at both plugs with tissue paper. If there is a slight difference in the diameters of the plugs, one may put one in the place of the other and divide the difference. J. SCHURING.



TESTING A SQUARE.

Pay for Useless Work—Differences in Workmen—Writing Fractional Measures.

Editor American Machinist:

Who of us hasn't some time spoiled something? "A man that never made a mistake never did anything." Next to spoiling a thing is, after spending much time and thought on a job and getting it all done, seeing a better way that would have taken about half the time. I remember a certain case of this kind. A piece was wanted to perform a certain operation, the design and construction of it being left to me. It was made and was thought to be just what was wanted. The next day, on looking it over before sending it out, I saw where a part could be left off, a lug and pin added, and it would perform the operation in two movements instead of three. The first thing was broken up and another was made. The man that got it never knew that he paid for a piece he didn't get, but I am sure the charge was just.

. . . . . .

It does seem true, as "Old Bob" remarks, that the perfect pattern shop is hard to find—just about as hard as the ideal patternmaker. I have had men come to me, recommended as first-class patternmakers, who would ask me any of the following questions: "Which way shall I draft this?" "How many nails shall I put in that?" "How fast shall I run this piece in the lathe?" "How long shall I make this core print?" "How big a dowel shall I use?" or have them put the dowels about 14 inches apart in a pattern 2 feet long, make a corebox and leave about $\frac{3}{8}$ inch of stock outside so that the coremaker could split it easily, have them turn up a pasted pattern and saw it in halves (?), or other nerve-racking things, too numerous to mention. You can't always tell what kind of a mechanic you are getting until you try him.

One of the best men I ever had came into the shop one day and asked for a job in a half-hearted, hesitating way. Being bad-

ly in need of help, I put him to work. He was a German, who hadn't yet mastered our grammatical construction. On small work his jobs were clean looking, accurate, and quickly done; little explaining of drawings was necessary. If a piece was good enough cut out with an ax he didn't use No. 0 sandpaper on it. If three blows were enough to drive a nail he didn't use four. He went to work on time, and quit as promptly; but he didn't mind staying a few minutes if necessary. He didn't seem to exert himself more than the others, but he did get the work out, with few mistakes. How often have I wished for more like him!

. . . . . .

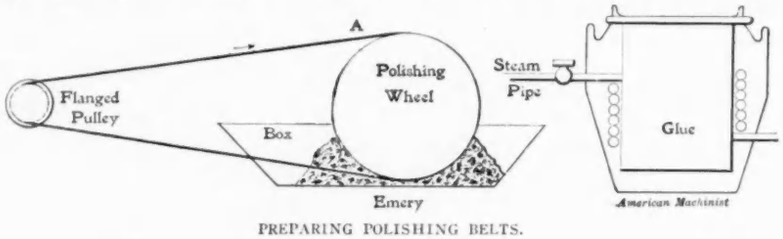
If the dimension 21-64 cannot be avoided and it is written 5-16 + 1-64, and the workman fails to see the 1-64 (and it's an even chance he will), the piece is made 1-64 too small and consigned to the scrap. The draftsman blames the workman, the workman the draftsman, and the boss pays the bill. J. L. GARD.

Preparing Polishing Belts.

Editor American Machinist:

I have noticed in your columns some letters about preparing polishing belts. I did not suppose anyone had trouble with them. I can tell you about the way we do. The belt is a non-elastic web which we buy in Philadelphia, the joint being sewed on a machine.

We cover ten or a dozen of the belts at a time. They are placed, one at a time, on a small pulley with a flange and run on a very much larger pulley or an old polishing wheel with a face a trifle narrower than the width of the belt. This allows the glue and emery to cover the edges of the belt. A boy stands at *A* and applies the glue as he pulls the belt towards him,



PREPARING POLISHING BELTS.

as indicated by the arrow. The other boy stands at one side of the box or trough and keeps the emery heaped upon both sides of the wheel face, so that by forcing the wheel through this pile the emery is applied with considerable force. The box is long enough to catch any emery that falls off. The belts are then hung on round pegs to dry. These belts are used to polish the rings of scissors and forceps, and when in use are run between a large double-flanged pulley and a small flat pulley, so that if the work should catch, or the polisher's hand, the belt runs off the small pulley.

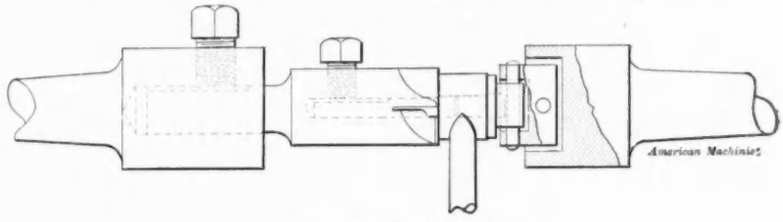
As to the glue, we use a medium grade, which costs 22 cents, ground. We do not allow it to boil, and it is made fresh each time. The glue pots are attached to live-steam pipes by a copper tube made into a coil in the water pot; the glue pot sets into the center of this. Keep the brush clean.

GEORGE P. SHARP.

A Self Adjusting Thrust for the Tail Spindle.

Editor American Machinist:

The sketch herewith is to show a gimbal jointed thrust piece for the tail spindle of a lathe, to be used in connection with a counterbore in the live spindle, for facing hubs and such work. It is only necessary



A GIMBAL THRUST BLOCK.

that the tit of the counterbore properly fits the hole in the piece to be faced and then the facing is bound to be true with the hole. No further explanation is required. S. W. PUTNAM.

Holyoke, Mass.

Backwoods Engineering.

Editor American Machinist:

Having read with interest and profit the experience of others, I wish to tell about an experience of my own in the backwoods of New England. I was called upon to help rebuild a burned sole leather tannery. After a short journey by rail and a drive of 20 miles directly into the deep woods, the last 6 miles on a corduroy road through swampy land, arriving late in the afternoon, I met the president and general manager of the tanning company. I found him a gentleman and an expert, as far as running a tannery was concerned; but money spent in new and up-to-date machinery was with him a deliberate waste if he could devise a makeshift that would by any means answer the purpose. He took pains to impress on my mind from the first that we should have to scour up and rebuild all the burned machinery as far as possible.

On making a survey of the ruins we found the old tannery had made a clean burn; nothing left that could burn; all the iron work in the worst possible shape imaginable. We had got to get our shafting, pulleys and boxes from that mass, and this in connection with the general surroundings gave me a decided feeling of homesickness. The first thing was to make up drawings of the proposed plant, showing the location of the different machines, subject to the approval of the manager. After this there were the details of shafting, pulleys, etc.; then overhauling the ruins and picking out such parts as were suitable (from the manager's point of view) to use again and have them sent to the shop if necessary. There were two horizontal tubular boilers, 60 inches by 15 feet, in a setting of field rocks laid in mortar lined with firebrick where flames came in contact with setting. In front of the boilers were the tan furnaces with grates 10 feet long. One boiler was about 1½ inches higher than the other in the setting.

The engine was a curiosity in itself and regardless of the fire. The cylinder was 14x50 inches, having previously seen fifteen or twenty years' faithful service on a river steamboat. The steam chest was on top and lugs or feet on the bottom. The flywheel had done service on another engine years before. It was 8 feet diameter by 24-inch face. Crank shaft and crank arm were new. The parties who had assembled this machine had evidently failed to find a bed casting that suited them. They overcame this difficulty by building up a foundation of field rocks laid in cement, with an offset to allow crank and connecting rod to swing clear. On top of this foundation, secured by anchor bolts set in the wall, were placed some hardwood timbers, 6 inches thick; the lugs on the cylinder and pillow block were let down about 1 inch into the wood and bolted securely. The engine had been burned in the tannery, but the manager considered it worth repairing; so having sent the cylinder to the shop, he was willing to risk the rest of the engine. The wood work we replaced and bought a new governor and scoured up the connecting rod and slides.

We needed about half a million feet of sawed lumber to put up our buildings, so the manager decided to put up a sawmill and saw it on the spot. It was necessary to locate the sawmill so as to drive from the tannery engine and at the same time not interfere with any of the tannery buildings. There was a half of a jaw clutch keyed to the back end of the engine shaft, and from this we led out 63

feet with 3 7-16 inch shaft, some of the burned shaft having been sent to the shop and straightened at the forge and turned at the bearings. On the end next to the engine we had a half clutch made to slide on a feather to fit that on the engine. Upon belting up to drive the sawmill we were obliged to put in an intermediate shaft to get our speed from 60 revolutions to 720. When all was ready we started sawing. Strange as it may seem, the engine and shafting ran all right until the lumber was all sawed. Driving the sawmill was a very severe test on the engine, it requiring at least 50 per cent. more power than would ever be used in running the tanning machinery.

In belting up to drive the tannery we had to belt from the old flywheel on the engine to an overhead shaft about 16 feet distant horizontally. On starting up we found the flywheel had been flattened about 1 inch in the fire, causing the building to vibrate with every revolution. From my point of view the only thing to do was to bolt on hardwood logs to the face of wheel and turn it off round; but the manager suggested a better (?) way, which certainly had the advantage of being cheaper—that was, putting in diagonal braces from one band of the frame to the other and running the belt very slack, the slack of the belt absorbing the vibration.

There were numerous other features about this plant nearly as unconventional as those named; but, in spite of all my expectations, this machinery has been running for over two years and making money for its owners, with only small outlay for repairs. M. E. F.

Rig for Babbitting Pillow Blocks.

Editor American Machinist:

I send sketch of a handy babbitting rig for pillow blocks, where both the pillow block and cap may be poured at one setting. Fig. 1 is a plan showing a pillow block in position ready for pouring, and Fig. 2 is an elevation of the rig without the pillow block. A flat plate is used, which may be round, as shown, or of any other shape. The standards *A* may be moved or adjusted to any position to accommodate any kind of a pillow block, and then they are held firm by the cap-screws. The babbitting mandrel is held in place by the cap-screw tapped into the lower end of it, and is easily changeable for any other size or length. To make the mandrel, a piece of shafting is cut off and faced square on the end and drilled and tapped for the cap-screw. Grooves are milled or planed the entire length and on opposite sides, and of the right width to take the shims to part the pillow block and cap. *F* is a piece of soft rubber packing, and when the box is placed on it it will make a good joint, so that the babbitt will not run out. No clay or putty or anything of the kind is required about the job. The pillow block and cap are laid together on their sides and the two wedges hold them tight against the shims and the one pressing against the other. The shims of course determine the thickness of the babbitt at the top and bottom, and the thickness at the sides may be equalized near enough by the eye. With this rig a man can babbitt sixty or seventy complete boxes in an hour. If the bottom of the box must be parallel with the babbitting, four or more of them, after they are babbitted, may be clamped upon a piece of shafting and the shaft bolted on "V's" on the planer, then with blocking under the feet a light cut may be taken over the bottoms, making as good a job as one could wish. "IOWA."

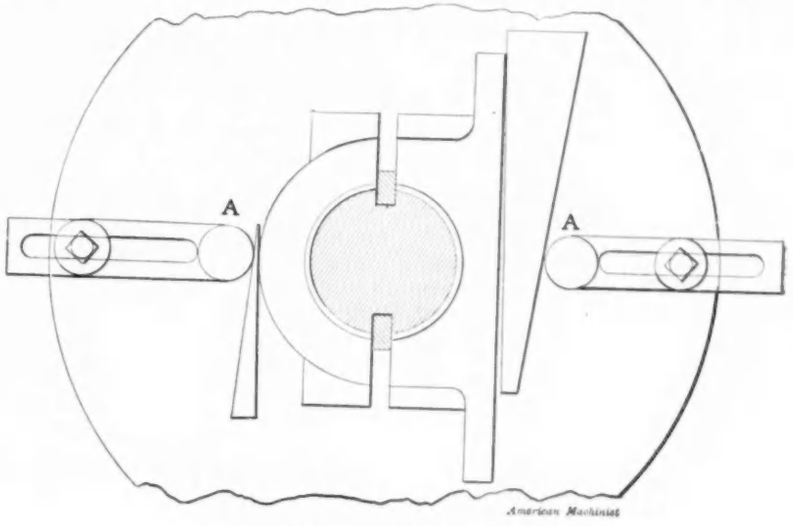


FIG. 1. PLAN OF QUICK BABBITTING RIG.

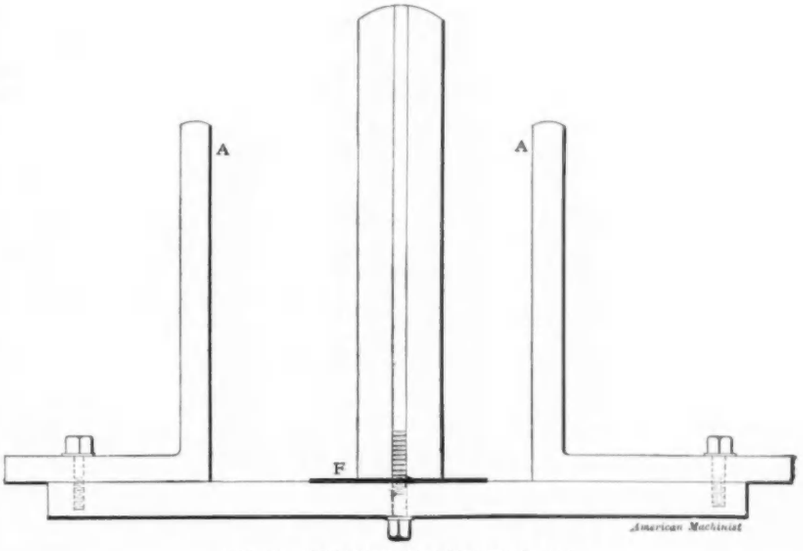


FIG. 2. ELEVATION OF BABBITTING RIG.

Pattern Shop Circular Saws.

Editor American Machinist:

The very interesting letters and sketches that have appeared lately in your columns on the subject of the "Pattern Shop Circular Saw" make me think that this valuable machine tool is wofully neglected in many shops, in spite of the well-known fact that, with proper attention, it is one of the best of labor-saving tools.

Referring to the letter of M. E. W., on page 386, where he telis us of his tribulations and hard trials while tusseling with the circular saws that his foreman was proud of "showing off" to visitors, it strikes me that he resorted to extreme measures to make them saw wood. The secret of their successful manipulation is in using "hollow ground' or "concave" saws for both rip and cross cut, avoiding the swage set altogether on the rip saw and using no set whatever on the cross-cut.

Our method is as follows: For rip saws we "spring set" every other tooth toward the side nearest the guide *only*, leaving the other teeth without set. The reason for this is that when ripping stock, where only the thickness of the saw-cut, or less, is to be taken off, the saw dulls very fast on that side if without set, on account of coming in contact with the grit of various kinds that pattern lumber has an affinity

for; and swage-set we find has but little durability under these conditions. For cross-cut saws we file the teeth "both ways" with the front of the tooth radial. For the back of the teeth, whatever their angle, four points to the inch we allow when the depth of the tooth is as the distance between points.

The shape of the teeth is not of such material importance as M. E. W. and Mr. Porter would have us believe, as any tooth with a good base connection, sufficient "hook," and reasonable clearance back of the point, will always give good results, provided the gage is a stiff one in proportion to diameter. This is something to keep in mind when ordering saws, as most pattern shop saws are too thin and weak for the service required, and burn, chatter and tear away the stock, when with foresight and care the stock could be removed cleanly and without a display of the negative pushing ability that some patternmakers acquire (unconsciously, of course) from working on dull circular saws.

Another point to remember is, that, before removing the saw from the arbor, the machine should be started and the points of the teeth trued with a piece of emery stone held in front of the saw until it touches every point. Then file the teeth until the spots touched by the stone just disappear, which will give every tooth point a chance to do its share of the work, if the hole in the saw fits the arbor as it should.

In our shop we have two rip saws, 20-inch, 10 gage, and 16-inch, 12 gage, also two cross-cuts, 14 and 16-inch, 13 gage, all hollow ground, that we use on one machine, and they give perfect satisfaction when kept in condition on a machine where the saw can be raised and lowered to secure a proper angle between the stock sawed and the points of the teeth; and it's the point that does the cutting, after all—a "point" that appears to be lost sight of in the maze of such technical terms, denoting erudition in saw lore, as "gullet," "rake," "hook," "swage," etc.

"Old Bob."

A Handy Clamp for Drill Press Table.

Editor American Machinist:

In sending a sketch of a device of this kind we can hardly expect that it is going to be new to everyone, but we can be reasonably sure that what has been found useful by one will be useful to others. The clamp shown is a very handy tool about a drill press. The shank, which is turned round, is pushed loosely through a hole in the drill press table until the lever bears on the work, when a twist on the set-screw makes a tight grip. If the shank is made 5/8 or 3/4 inch in diameter it will slip into the holes and slots of a medium sized drill press table. The lever *A* and arm *B* should be of a section to stand about the same strain that the shank will, when the arm is about 1½ inches from the table, as shown in the sketch. For a 5/8-inch shank the lever should be 9-16 by 1¼ inches at the fulcrum pin. If the shank is made 3/4 inch, the lever to be strong in proportion should be 5/8 by 1¼ inches at the pin. The pin should be 5-16 or 3/8 inch, with a bearing of 5-16 inch on each side. The set-screw may be 3/8 or 7-16 inch. S. B.

A Kink in Chucking.

Editor American Machinist:

The following method of using an upright drill for chucking holes is quite efficient on some classes of work:

Clamp an ordinary universal lathe chuck on an upright drill table, so that a round piece of stock tightened in the jaws will be in line with the drill spindle. It will be necessary to put parallel strips under the body of the chuck, so that the threaded end that screws on the lathe spindle will be clear of drill table. Then clamp with straps and bolts in the manner of clamping work to lathe face-plate. Now put work in the chuck with right size drill in the spindle and start the feed. It is much easier than pushing the drill through with a tailstock hand-wheel, and reduces the time nearly one-half. Of course work that is required to be trued nicely cannot be handled in this way; but where work is to be finished all over and there is stock enough for a good chip, it is a time-saver over an ordinary lathe. N. A. C.

[This is a method quite generally followed in some shops, but may be new to some of our readers.—Ed.]

Fillet Gages—A Job for Someone.

Editor American Machinist:

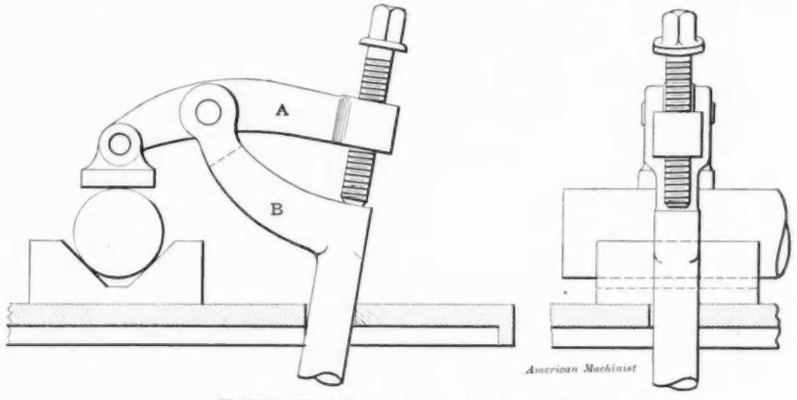
You have at various times discussed the question of rounded corners as applied to machine design.

I suggest that small-tool makers provide gages for such rounded corners and arcs.

If the toolmakers who provide our scales, metal triangles, center gages, etc., would manufacture fillet gages, say from 1/8 to 4 inches radius, they would soon be in use by cabinet and pattern makers, by lathesmen, for the fillets and ogees on rod work in marine shops, for fillets on journals, for hand-wheels in small machine tool or model shops, and the lathe hand would soon lend them to the vise and floor hand, for convenience in laying off work.

Figs 1 and 2 show home-made gages to be found in many shops.

Philadelphia. Ferd. Wertheim.



A HANDY CLAMP FOR DRILL PRESS TABLES.

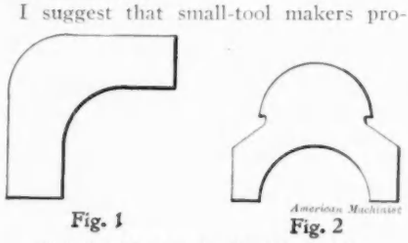


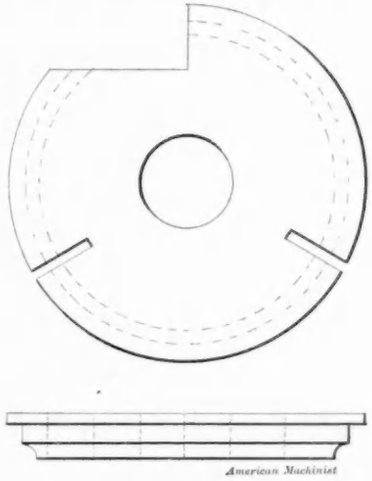
Fig. 1 Fig. 2

FILLET AND ROUND CORNER GAGES.

Hardening Without Cracking.

Editor American Machinist:

While going through the shops of a prominent machine tool manufacturing concern noted for the excellence of its automatic screw machines and the general quality of its work, I noticed a simple device for preventing cracking in the hardening of thin flanges and cutting edges of small circular forming tools. This may not be new, but I had never seen it, and thinking that others among your readers might be glad to know of it, I send you this sketch.



CAN BE HARDENED WITHOUT CRACKING.

The tool merely has thin slots milled in it in three places, equidistant, to a depth

entirely below the cutting edge. The contraction of the metal in cooling is thus provided for, and the usefulness of the tool is not impaired or endangered. The gentleman in charge of this department tells me that their losses in hardening are practically eliminated since adopting this plan. W. C. RODGER.

Practical Shop Use of Micrometer.

Editor American Machinist:

Mr. Slocomb's article, page 494, on "The Use of Micrometer Calipers" for regular shop gages, touches on a subject which I have always contended was not given the consideration its importance deserves, by a large majority of shop foremen and superintendents. It is a subject that has claimed some portion of my "gray matter" for the best part of the last fourteen years, and I am glad brother Slocomb has given me the opportunity to add the results of my observation and experience to his.

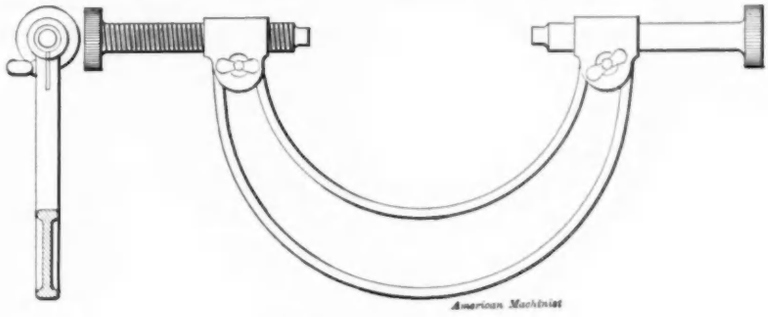
A lathe hand of indifferent ability will work to within a thousandth of an inch of size, if provided with a rigid caliper accurately set. The average machinist, with the same gage and in the same time, can work to within a quarter of a thousandth, and the fine workman to within a ten-thousandth of size, though requiring more time. These men could have nowhere near approached these limits with any degree of certainty, using the ordinary caliper. Now, the question naturally arises in the mind of the foreman alive to the economic possibilities of his position, as to whether or no a caliper, of the necessary rigidity and accuracy, could be furnished for general use in the shop at a reasonable cost. Limit gages are of course out of the question, for it would be beyond reason to expect a gage or several gages for every size used in the shop, and, besides, the objections raised by Mr. Slocomb are very good ones. The micrometers, however, fill the bill admirably, except for the expense of providing them for general use in a large shop, and the fact that, in a majority of cases, the treatment they received would not be such that they could be called instruments of precision very long.

The accompanying cut is of an adjustable snap gage that I have used for several years as part of a shop system of measurement that I have found very satisfactory. These gages can be made at a very small cost, especially if a number of them be made at the same time. The one shown here will take in anything up to 3½ inches, a size of gage most used in general lathe work. The frame is of cast steel, very light and rigid; the rod and screw are 5-16 inch in diameter, the latter having 20 threads per inch and locked when adjusted by the thumb-screws shown. We experienced no difficulty in making the rod and screw come exactly in line. It was done in the following manner: The holes were drilled on the lathe centers and then split with a hack-saw whose soft back had been cut down until it would pass through the hole. The holes for the thumb-screws were drilled next, the top half to the whole diameter of the screw, and the bottom half tapped. A cast-iron sleeve, 1½ inches long and 7/8 inch diameter, was then made to fit snugly over the shank of the tap, which had been shortened by cutting off the square end. The shank was entered one-half the length of the sleeve and a hole drilled through sleeve and tap and fitted with a pin. The hole for the adjustment screw was then tapped from the inside of the gage outward, the shank end of the tap being supported in line by a rod passed through the other hole into the sleeve and rigidly clamped by the thumb-screw. The tap was turned by a small bar fitting into holes drilled around the sleeve. The ends of the rod and screw are hardened and ground.

Under the system which I have employed and found so satisfactory, we used 0.1 inch square steel wire for "points," as the men called them. If a man had certain sizes to turn that had to be quite accurate, he would cut off pieces of this wire about the length required, stamp the size on it and round and taper the ends so that they were about 1-32 inch in diameter. These points he made approximately to size and then gave them to the foreman, who tested them with a vernier caliper in his office, fitting each with a rub or two of the file, or perhaps a blow of the hammer on a small anvil beside the instrument, to bring it up to size. It is then a simple matter when the work is roughed down nearly to size, to quickly and accurately set the snap gage to the point, making practically a solid gage. These "points" are very quickly made, and can of course be kept for future use. A man seldom required more than the suggestion that he could get his points ready while his machine was running before he made a practice of doing so. For sizes over 10 inches we used a piece of broom handle or other wood, with a pointed wood screw in either end, flattened for a wrench. When extreme accuracy was necessary in the smaller sizes, a small piece of wood was drilled out and pressed over the wire to keep the heat of the fingers from expanding the gage while setting. These "points" can't be beaten for inside gages, especially in getting the size of a hole already bored when it is necessary to turn a piece to fit it exactly.

Besides these snap gages we had a number of the regulation micrometer calipers of all sizes in the toolroom, and accessible to anyone competent to use them; but I noticed that it was not long before there was hardly any call for them, even by our best workmen, after they had become accustomed to the new system. I have never known a machinist who had tried the system but who was in love with it, and, besides producing the work within the desired limits, I found the total time consumed much shortened.

W. H. M. "MINNESOTA."



A MICROMETER SNAP GAGE.

A Rip Van Winkle Shop.

Editor American Machinist:

Referring to "Nobody Did It" and your comment thereon on page 746, I would call your attention to the following: A shop employing about thirty men is engaged principally in manufacturing, although they also do some jobbing. Among their equipment is a turret machine which has been in constant use for over twenty years and which has never been touched for repairs (the older hands say) except when broken, and then only to repair the break. An engine lathe of a good standard make, about 26-inch swing, has the live spindle out of parallel with the bed horizontally to such an extent as to cause considerable trouble. If a piece of work is chucked and the hole bored in the ordinary manner, the hole will be taper, largest toward the headstock or left-hand end. Armstrong and similar tools are unknown in this shop.

The emery machine spindles in the shop are reversed, so that the friction of the work on the wheels tends to unscrew the nut. This is general all over the shop, including a Brown & Sharpe universal cutter and reamer grinder. A workman once changed the wheel arbor on the cutter grinder, only to have the foreman reverse it again as before.

The lathe equipment of the shop consists of about one dozen lathes, some modern, with three sizes of live spindle thread, and about four scroll chucks made interchangeable as follows: A face-plate is fit-

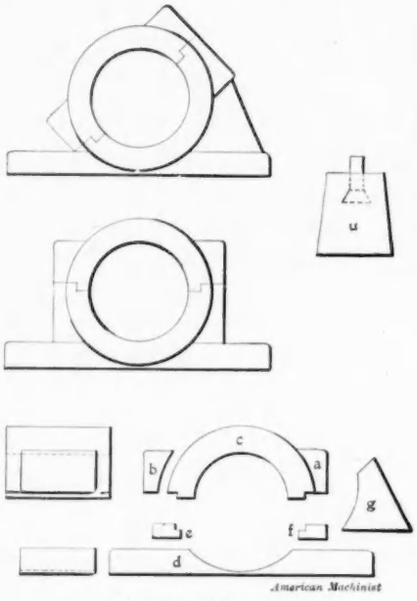
ted to each of the various spindles for each of two or three chucks. When some particular chuck is fitted to a lathe which is in use at the time a man to use the chuck takes off the face-plate and puts on the face-plate to fit another lathe spindle, and so on. These things may be doubted, but they are nevertheless true; and what is more surprising is that the establishment is apparently being conducted at a profit. J. R. P.

West Philadelphia.

A Combination Pattern.

Editor American Machinist:

Two special pillow blocks and two similar post boxes were wanted in a hurry, and on account of their special nature it was not deemed advisable to make elaborate patterns. The sketch Fig. 1 shows



A COMBINATION PATTERN.

the post box and Fig. 2 the pillow block. The joint was to be planed and they were to be bored for roller bearings.

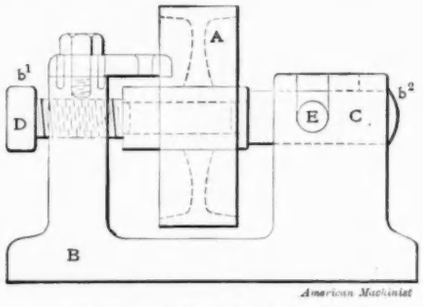
The patterns are shown in Fig. 3. The piece *a* being glued to the half-ring *C* and lug *b* screwed on, this finished the pattern for the four caps. When these were molded the cap pattern *C* was inserted and screwed on the base plate *d* and the strips *e* and *f* were nailed on, which completed the pattern for the two pillow blocks. The lug *b* was next removed and strip *e* was split where the dotted line is shown. The half-ring was then screwed on the same base plate *D*, but in the position shown in Fig. 1, at an angle of 45 degrees. Bracket *G* also was screwed on to facilitate its removal for any possible future changes. No varnish and very little sandpaper was used on the pattern, and the molder didn't kick, either. The time taken was about one-third of the patternmaker's first estimate, and he didn't have to hustle much. It was only another case of head versus hands.

Another nut to crack was to provide about four hundred distance pieces about 1¼ inches long to be riveted on one end to ⅛-inch sheet steel plates. It was at first intended to turn them from a bar, but as we had no automatic nor even a screw machine this was soon abandoned. It was suggested to make them of brass, then of cast iron, with a hole bored through for a rivet, but we finally cast an iron rivet in each piece, as in Fig. 4. The patterns were fastened to a board and gated about thirty to a flask. A print on the ends of the patterns located the rivets, and little tweezers were used to place them in the molds. Geo. J. Meyer.

A Jig for Drilling Wheel Hubs.

Editor American Machinist:

The sketch shows a drilling fixture which is quick to operate and capable of being quite generally applied. As here shown the jig is for drilling a hole in the hub of a pulley, but it can be used for the hubs of gears or other work of that sort. For work with hubs, as cams or levers, a stop could be set to bring the drilled hole at any desired angle from a given point on the work. If the center line of the screw and of the stud b^1 and b^2 was at an angle with the base the hole could be drilled at an angle with the bore of a pulley and inside the pulley rim, as is sometimes desired for oil holes.



JIG FOR DRILLING WHEEL HUBS.

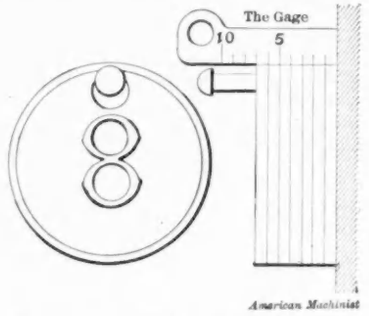
In the sketch *A* is the pulley or other work to be drilled. *B* is the fixture casting. *C* is a stud with a handle *E* driven into it at a right angle. This handle drops into a slot cut into the casting. When in this position the end of stud *C* is in the bore of the pulley and the shoulder of the stud makes the gage point. Lifting handle *E* until it is vertical the stud can be pushed back, as indicated by the dotted line, until the stud will clear the pulley. When the stud *C* is in place the screw *D*, with knurled head, is screwed in until its end also is in the bore of the pulley and the work is against the shoulder of stud *C*, when all is ready to drill the hole. This is what the boys call a fast fixture, as the twist of the screw *D* is so little and stud *C* is so quick to operate. M. A. P.

Simple Tool Checking.

Editor American Machinist:

I can't say that I altogether like that Young, double-entry tool-checking system described on pages 757-8. It is properly called a double-entry system, because there is a check for each tool, or set of tools, and also a check for each man. The numbering or other marking of the tool checks would come to trouble and confusion when the tools became very numerous. Only numbered checks for the men are necessary. Hang each man's set of checks on a wire nail on the board, as shown in the sketch, usually limiting him to ten checks. The gage, which the toolroom man keeps handy, will always show without counting how many tools a man has out. When a man takes out a tool or set of tools, put one of his numbered checks in place of the tool. This check will always tell who has the tool. It is not necessary to be able to tell instantly what tools any man has. This could only be required when a man was leaving and had to account for any tools he had out.

A short time ago a question came up in the "American Machinist" as to the propriety of charging the men for checks lost. This question should never arise, as the men should never carry the checks. If they are kept in the toolroom they are always just where they are to be used, and no time is lost in looking for them, and



HANGING AND COUNTING CHECKS.

the men can never think of borrowing or exchanging checks. There is nothing new in the system here advocated, as I knew of its successful use many years ago.

Morris Fulton.

Some New Things.

MINIATURE MICROMETER CALIPER.

H. W. Cotton, of Rochester, N. Y., is making a miniature micrometer caliper for use as a watch charm. This caliper is precisely the same as the larger instruments and will measure things, the only difference between it and the regular ones being in its diminutive size and the fact that it has a ring attached to it for suspension from the watch charm of the wearer.

SIX-INCH RULE WITH SLIDE—WIRE GAGE.

Among the new tools lately brought out by the Brown & Sharpe Manufacturing Company is a 6-inch rule with a slide adapted to be moved by the thumb, and which when set to any desired graduation

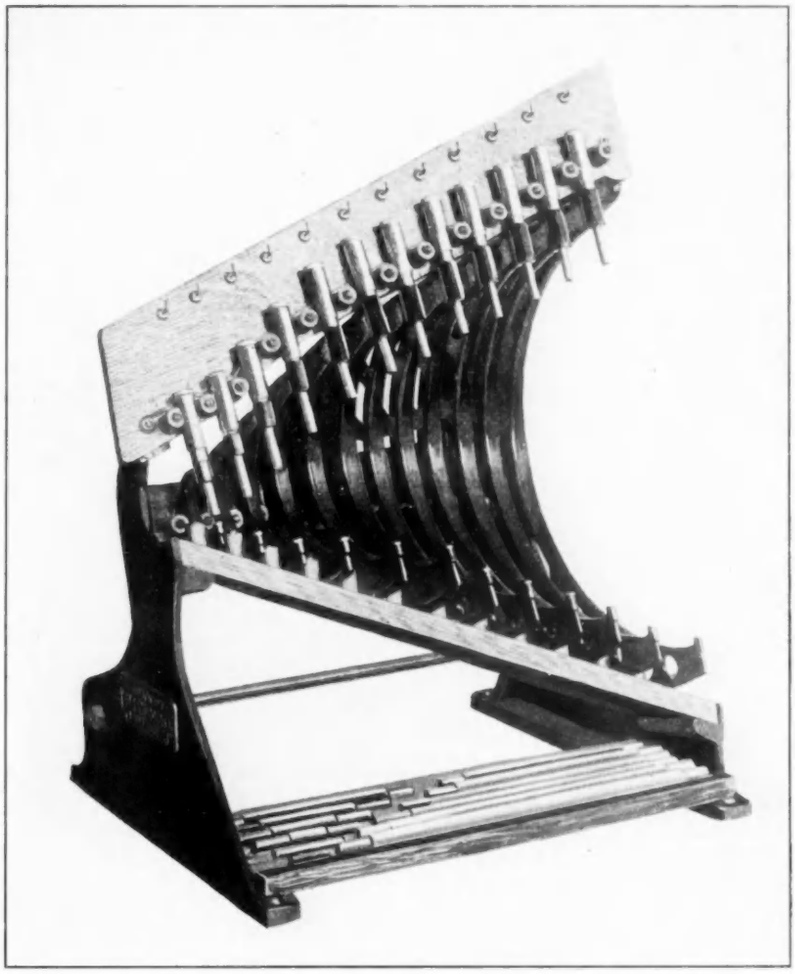
forms a convenient shoulder for the measurement of flanges, collars, etc., or for setting calipers.

They have also brought out a new wire gage, known as the Washburn & Moen standard wire gage. This has gage numbers from 0 to 36, is made in the usual disk form, is made of steel, hardened, and with sizes tested after hardening.

A SHOP SET OF MICROMETER CALIPERS.

The half-tone shows a set of twelve micrometer calipers covering the range of sizes which it is usually desirable to determine with accuracy in the modern machine shop. The range of each caliper is 1 inch. The frames up to 6 inches are drop forged from bar steel, and the larger sizes are steel castings with openings in the web, like lattice work girders. All are finished in black enamel, and those above 3 inches are plainly marked with figures indicating their range. Where the calipers are made for metric measurements the figures run consecutively all through the series, the first starting at 0 and going to 25 m/m, the second 25 to 50, and so on, the last being 275 to 300 m/m. The set as shown is of course intended for the toolroom. There are hooks above for the workmen's checks, and a grooved board below for a set of end measures for correcting the adjustments.

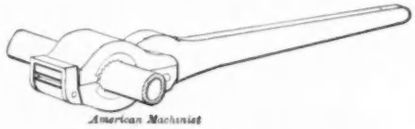
This plan of having a series of calipers, each complete in itself and each with a range of an inch, is one to commend itself to shop managers, both because a number of micrometers are sometimes needed by different men at the same time and because no caliper should be very much larger than the size it is to be used for. This set is made by J. T. Slocomb & Co., Providence, R. I.



A SHOP SET OF MICROMETER CALIPERS.

AN EFFECTIVE PIPE WRENCH.

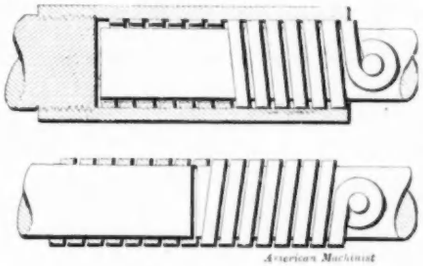
The accompanying cut, from the latest pipe wrench patent of the thousands which have been issued, seems to deserve reproduction from the presumption that it is an effective gripper and that it will hold a pipe tight without necessarily crushing it out of shape, as most of these devices purpose to do. The gripping jaws in this wrench nearly fit the circle of the pipe, and are of course exchangeable for other sizes within a certain range. The compound lever action of the handle must give a strong pinch if the resistance calls for it.



THE LATEST PIPE WRENCH.

A SLIPPING CLUTCH.

The cut shows a recently patented friction clutch which might be of service under certain conditions. The purpose of it as shown, and as claimed by the inventor, is for driving with sufficient force but of slipping when the resistance of the driven part is increased. The shaft at the right Fig. 1, is the driver, turning toward the observer as indicated by the arrow. Upon this is the helical spring fastened to the shaft by the pin as shown. The spring fits quite loosely on the shaft, but the outside of it, which is ground true, is normally somewhat larger than the interior of the sleeve projecting from the driven shaft, so that it is tight in the sleeve when forced into it, and this tightness is depended upon to do the driving. If the driven shaft should resist sufficiently for the driver to turn any faster than it, or to advance slightly in relation to it, the tendency would be to wind the spring tighter on the driver and to reduce its outside diameter and allow the driven shaft to slip easily. This feature of the device is all that is covered by the recent patent.



A SLIPPING CLUTCH.

If the driver turned in the opposite direction a very positive drive would be provided, as the resistance of the driven shaft would cause the spring to press continually tighter in the sleeve. Any stoppage or slowing up of the driver would at once reduce the spring diameter and allow the driven shaft to turn as long as its motion was greater than that of the driver. In Fig. 2 the sleeve is not used, the spring clasping the driven shaft directly. The action is the same except that the coil of the spring is reversed, and it releases by its enlargement instead of by its contraction.

A TOOL-HOLDER.

The cuts show a recently patented toolholder for lathe or planer or other machine tool. The body *A* of the holder is a piece of rectangular steel of the usual proportions, and which is secured in the toolpost in the usual way. A hole runs longitudinally through this piece, and in this hole fits loosely the stem of an eye-bolt, the eye of which sets in a cavity at the front end of the holder, while a nut with a side handle of sufficient length and

weight fits on the back end of the stem. The cutting tool is tightened in position by turning the handled nut at the back end, and released by a reverse movement of the same. In Fig. 3 a V-tool *C* is shown in elevation in position in the holder, while the eye-bolt *B* and the body of the holder *A* are shown in section. This tool has a round shank 20 which nearly fits the vertical hole in the eye-bolt *B* and also the hole in the bottom of the holder. The back of the upper part of the tool is a vertical plane tangent with the stem, or nearly so. When the eye-bolt is drawn backward by tightening the handle nut, the head of the tool is forced backward against shoulder 13 and the stem is also tightened against the back of the vertical hole in the holder at 12. In Fig. 4 is shown a top view of the holder with a tool which has an inclined side-cutting lip, this tool being held in the same manner as in Fig. 3. Figs. 1 and 2 show the means of holding boring tools. The boring tool is held in a special socket, the hole in which for the tool may be made at any angle desirable. This socket has a round stem 20, the same as the plain tools, but it has also at the top a rectangular channel in which slides the dog 27, which projects back a little beyond the vertical stem, while the front end of it fits into a groove in the shank of the boring tool. When the handle nut at the back of the holder is tightened, the socket is clamped in the holder, and at the same time the dog 27 binds the boring tool in the socket. A half turn of the handle nut at the back is always sufficient to release the tool for grinding, resetting, exchanging for another tool or otherwise. The patentee of this tool is Charles W. Grant, Derby, Conn.

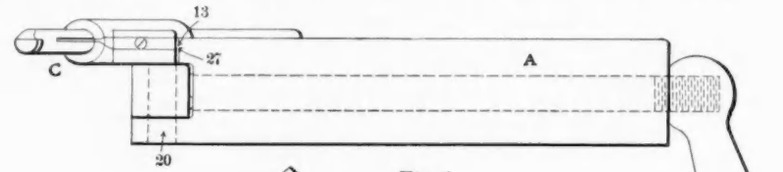


Fig. 1

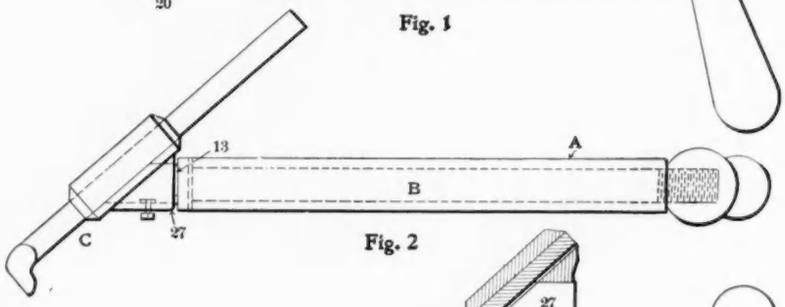


Fig. 2

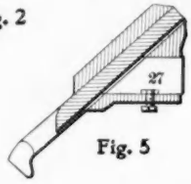


Fig. 5

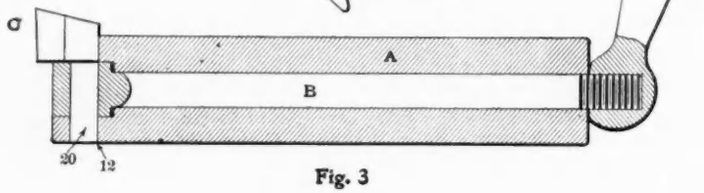


Fig. 3

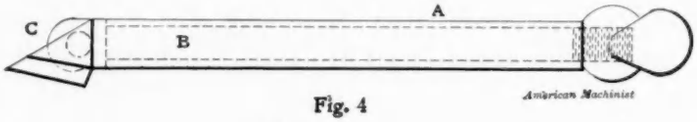


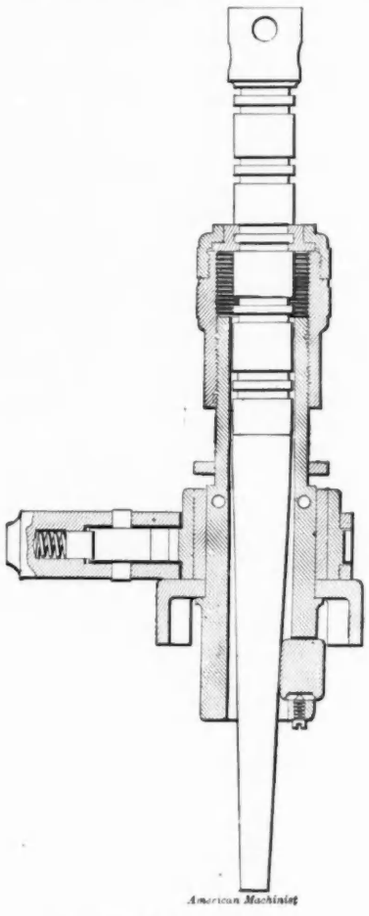
Fig. 4

A TOOL HOLDER.

A NEW TUBE EXPANDER.

The cut shows in section the "Atlas" tube expander, made by the Watson-Stillman Company, East Forty-third street, New York city. This may be considered an elaborate improvement upon the long-familiar Dudgeon expander, in which the expanding is done by three hardened steel rollers set out by a long, taper steel pin, the operation comprising a little driving of the pin and then a little turning of it, a quarter of a turn at a time, another drive, then another turn, and so on, with great trouble when lumpy welds were encountered.

In the expander here shown in section, instead of turning the taper pin and feeding it by continual hammering upon the head, the entire roller case is rotated by a ratchet lever, just as a ratchet drill is operated. As the case is rotated the taper pin is fed in by a fine screw, so that the operation is continuous until the expanding is completed. With this understanding of the operation of the tool the cut explains itself. *A* is one of the rollers. The scope of any size of this expander is double that of any of the old expanders, so that each is two in one. Where any one of the old expanders would work, say, from 2¾ to 3 inches, one of these will work from 2¾ to 3¼ inches, without changing rolls or pin. The change for different sizes within the range of the tool is made by changing the interlocking ring 10 to different grooves on the pin.



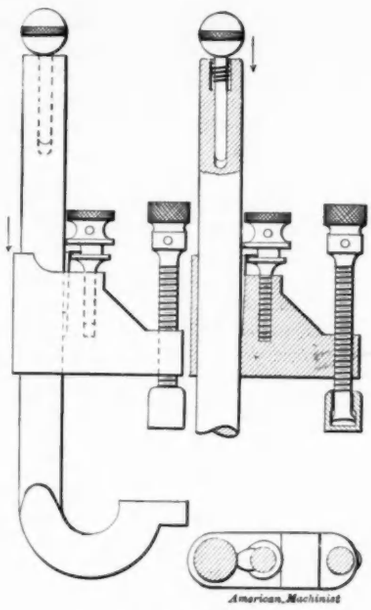
THE ATLAS TUBE EXPANDER.

A MACHINIST'S CLAMP.

The cut shows a recently patented clamp which the inventor thinks peculiarly adapted to machinists' use. The main bar of the clamp is round, and the clamping jaw can be readily slipped off and on, enabling the clamp to be slipped through holes or to be placed in positions otherwise impossible. The movable jaw may be fastened in any position on the bar by means of a taper key with a lip which projects into a groove in the thumb-screw by which it is tightened or loosened. A pin for use in tightening either of the screws is carried in the end of the bar, and is held from dropping out by a spring.

A LATHE INDEXING ATTACHMENT.

The cut, from a recently issued patent, shows a device which is of course impracticable, as shown, but which might, if properly applied, be found useful for some



A MACHINIST'S CLAMP.

lines of jobbing lathe work. It is often desirable to divide work while still mounted in the lathe, and the edge of the chuck or face-plate is often graduated for the purpose, but there is no reason why the belt surfaces of the cone should not be used as suggested by the cut. Standards for the indexing shaft may be secured at the back of the headstock where most convenient, but they should not clamp on to the journals of the lathe spindle. Serviceable numbers should be selected for the different circles. With the following numbers for the five circles of the largest step only of the cone—40, 36, 33, 32, 28—probably all the dividing likely to be called for could be done.

U. S. Civil Service Examinations.

INSTRUMENT MAKER.

The United States Civil Service Commission announces that it is desired to establish an eligible register for the position of instrument maker. No educational test will be given and it will not be necessary for applicants to appear at any place for examination.

Applicants will be graded upon the elements of age, character as a workman, experience and physical qualifications as shown by the statements made in connection with their formal application. Age limit, twenty years or over.

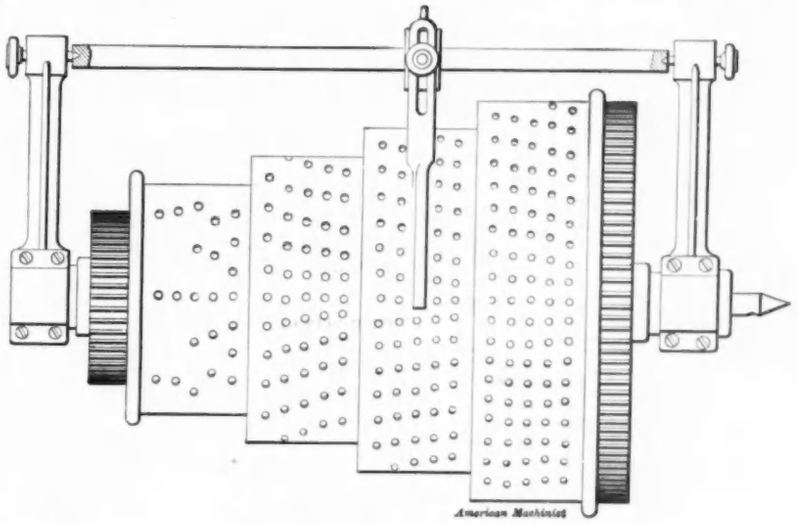
From the eligibles resulting from this examination it is expected that certification will be made to the position of instrument maker, Coast and Geodetic Survey, at a salary of $1,000 per annum, and to other similar vacancies as they may occur.

Persons who desire to compete should at once apply to the United States Civil Service Commission, Washington, D. C., for application form 1093 and special form, which should be properly executed and filed with the Commission prior to the hour of closing business on August 31, 1901.

COMPUTER.

The United States Civil Service Commission announces that on September 3, 1901, an examination will be held in any city in the United States where postal free delivery has been established, for the position of computer.

The examination will consist of the subjects mentioned below, which will be weighted as follows:



A LATHE INDEXING ATTACHMENT.

Subjects	Weights
1. Trigonometry	30
2. Algebra	10
3. Geometry	10
4. Logarithms	30
5. Analytic geometry	10
6. Differential and integral calculus	10
Total	100

Age limit, twenty years or over.

From the eligibles resulting from this examination it is expected that certification will be made to the position of computer, Coast and Geodetic Survey, at a salary of $1,000 per annum, and to other similar vacancies as they may occur.

Persons who desire to compete should at once apply to the United States Civil Service Commission, Washington, D. C., for application form 1093, which should be properly executed and promptly forwarded to the Commission.

These examinations are open to all citizens of the United States who comply with the requirements and desire to enter the service. All such persons are invited to apply, and applicants will be examined, graded and certified with entire impartiality and wholly without regard to any consideration save their ability as shown by the grade attained in the examination, except that preference may be given to residents of States or territories which have not received an excess of their share of appointments under the apportionment.

DRAFTSMEN.

An examination of applicants will be held at the Navy Yard, New York, August 7, 1901, or as soon thereafter as practicable, for filling the following position:

Office of the United States Inspector of Equipment, Crescent Shipyard, Elizabeth, N. J. One first-class assistant electrical draftsman, $4 per diem.

An examination of applicants will be held at the Navy Yard, Boston, Mass., August 7, 1901, or as soon thereafter as practicable, for filling the following positions:

Office of the United States Inspector of Equipment, Bath Iron Works, Bath, Me. One first-class assistant electrical draftsman, $4 per diem. Office of the United States Inspector of Equipment, Fore River Ship & Engine Company, Quincy, Mass. One first-class assistant electrical draftsman, $4 per diem.

The examinations will be open to all comers who can give evidence of experience in the kind of work for which they seek employment, and who are citizens of the United States. Persons now holding positions at the yards will be admitted to competition on the same footing as other applicants.

Applications will be addressed to the "Commandant, Navy Yard, New York," or "Commandant, Navy Yard, Boston Mass.," as the case may be, and must be delivered to him on or before Tuesday, August 6. No application received after that date will be considered.

Each applicant will state in his application his name, age, residence, citizenship, present occupation and previous employment or work done.

The applications will be accompanied by evidence of citizenship, and by certificates, preferably from previous employers, as to character, habits of industry and sobriety, and skill and experience in work of the kind required.

A Board of Examiners will convene at each Navy Yard on the 7th day of August, or as soon after as practicable.

Applicants will be informed of the date upon which they will be required to report for examination.

The Commandant will acknowledge the receipt of each application, enclosing a copy of this order, and inviting attention to the preceding paragraph.

The examination will be practical in character, having reference exclusively to the requirements of the position to be filled.

The applicant's antecedents and experience, as well as the character of his previous work, will be duly considered by the Boards in making their recommendations.

The Boards will make sufficient inquiry to ascertain that the applicants recommended are fit for the work; that they have enough education to make the required reports, estimates and calculations; that they are of reputable character, and of sober and industrious habits, and that they have not been convicted of crime or misdemeanor.

At the close of the examination the Boards will make reports, through the Commandant, to the Secretary of the Navy, showing the comparative merit of the applicants for the vacancy and designating the name of the individual who in their opinion is best qualified for the place. If the Boards report none of the candidates for the position as qualified, new examinations will be held, and the positions will remain open until qualified candidates are secured. The record of proceedings of the Boards, with all applications, certificates and other papers will be forwarded to the Department.

WAGES AND REGULATIONS.

Assistant electrical draftsmen—First class, at $4.00 per diem; second class, at $3.76 per diem; third class, at $3.52 per diem.

The questions in mathematics will comprise questions in involution, evolution, proportion, mensuration, volumes of solids, solution of plane triangles, intersections of surfaces and development of curve of intersection.

The questions in materials used in electrical devices will be on the kind of materials used in the manufacture of dynamos, engines, motors, wiring appliances, wire and its insulation.

The questions in electricity will comprise the theory, descriptions, and uses of the different kinds of dynamos and motors; description and sketches of switchboards, with the various instruments thereon; working problems under Ohm's law; description of primary and secondary batteries; arrangement of batteries for given requirements; testing instruments; laying out a scheme for wiring a naval vessel for light, power, and interior communication.

The questions in drafting will be in making a finished drawing in ink from a sketch of some part or parts of a dynamo, engine, fixture or electrical device; also making a tracing from a finished drawing.

The marking on education and experience will be based on facts submitted with supplementary statement and certificates of graduation from technical schools and testimonials and statements from former employers. The composition, spelling, etc., of the written examination, also the application and supplementary statement, will be considered under this heading.

SCHEDULE OF MARKS.

Mathematics	10
Materials used in electrical devices	5
Electricity	20
Drafting	35
Technical education and experience	30
Total	100

Questions and Answers.

Name and address of writer must accompany every question. Questions must pertain to our specialties and be of general interest. We cannot undertake to answer by mail.

(19) W. H. P. asks: What is the difference between one quare foot and one foot square, also how to prove it? A.—There is no difference; one square foot and one foot square are just the same, but as soon as you go above the unit then there is a difference. For instance, 9 square feet signifies an area equal to 9 times 1 square foot; that is to say, if it is in the form of a square its sides will be each 3 feet long, but 9 feet square means a square with sides 9 feet long and the area of it, instead of being 9 feet, will be 9 times 9, or 81 feet.

(20) J. D. G., Holyoke, Mass., asks: If I have an air receiver of 2.77 cubic feet capacity charged with air at a gage pressure of 3,000 pounds, and if I use the air at 80 pounds pressure and at the rate of 60 cubic inches per minute, how long will the charge last? A.—The capacity of the receiver in cubic inches will be: $2.77 \times 1728 = 4.786$ cubic inches. With air at 3,000 pounds gage pressure, or 3,015 absolute, the pressure in atmospheres will be $3,015 \div 15 = 201$. Then the free-air contents of the receiver will be $4,786 \times 201 = 961,986$ cubic inches. The air in the receiver of course cannot be discharged below 80 pounds gage pressure, or 95 pounds absolute, or 6⅓ atmospheres, so that $4,786 \times 6\frac{1}{3} = 30,311$ cubic inches of free air must remain in the receiver, and the available volume of free air will be $961,986 - 30,311 = 931,675$ cubic inches. The discharge of 60 cubic inches per minute of air at 80 pounds gage pressure will be $60 \times 6\frac{1}{3} = 380$ cubic inches of free air. Then $931,675 \div 380 = 2,451$ minutes, or 41 hours that the charge of air should last, provided that the normal temperature is maintained.

(21) C. T. J., Denver, Col., asks: How can I compute the drawbar pull of a locomotive in starting a train from absolute rest? Say that the cylinders are 20x24 inches, the boiler pressure 170 pounds and that the drivers are 60 inches in diameter. A.—The actual pull at the moment of starting the train will depend upon the position of the cranks. With the full boiler pressure upon the pistons in each case, Fig. 1 represents the position of the cranks with which the drawbar pull will be the greatest and Fig. 2 when the pull will be the least. We make no allowances here for the angular thrust of the connecting rods or the friction of the various working surfaces. Referring first to Fig. 2, $D\,C$ may represent the crank and $C\,E$ the radius of the driving wheel. The thrust of the piston at D in the direction of

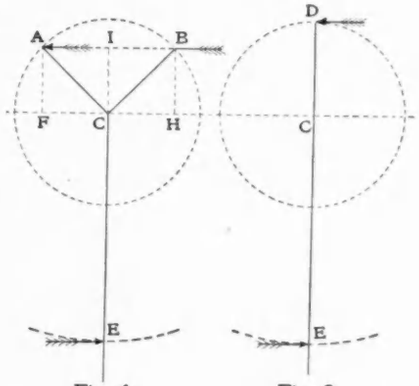


Fig. 1

Fig. 2
American Machinist

the arrow will be: $20^2 \times .7854 \times 170 = 53,407$ pounds. Then the thrust in the direction of the arrow at E, representing the drawbar pull, will be inversely as the lengths $C\,E$ and $C\,D$, or:

30 : 12 :: 53,407 : 21,362 pounds.

In Fig. 1 the thrust at A and at B is in each case, as above, 53,407 pounds, and it is the same as if the sum of both thrusts, or 106,814 pounds, was concentrated at I. The length of $I\,C$ is, of course, equal to $B\,H$, and as the crank is at 45 degrees $C\,H$ also is equal $I\,C$. As $B\,C$ is 12 inches the length of $B\,H$ or $I\,C = \sqrt{\frac{(B\,C)^2}{2}} =$ 8.485. Then the thrust at E is found by the proportion:

30 : 8.485 :: 106,814 : 30,210.

Supposing the train to be in motion at slow speed the average drawbar pull may be found by comparing the travel of the pistons for one revolution with the distance moved by the train, which, of course, will equal the circumference of the driver. The thrust upon one piston being 53,407 pounds and the stroke 24 inches, then for the double stroke and for the two pistons we have $24 \times 2 \times 2 = 96$. The circumference of the driver is of course $60'' \times 3.1416 = 188.496''$. Then we have:

188.496 : 96 :: 53,407 : 27,200 pounds.

From this, of course, there must be deducted a certain percentage, which can only be ascertained by experiment, for the loss by friction.

(22) "Providence" asks: If a compound engine of the Corliss type, which has been

run condensing, is to be run noncondensing, is it necessary to readjust the valves, and if so, in what way? A.—Not all, and in fact not many, compound engines that were originally designed to run condensing can be economically run without the condenser, and this is especially true of high-grade engines. In such engines the low-pressure cylinder is made large in order to give a high total rate of expansion. When a condenser is to be used, the designer may expand the steam down to almost any terminal pressure that he chooses, but without the condenser the steam should not be expanded below the atmosphere, since to carry the expansion further would lead to a "loop" in the diagram, with consequent large loss. If a combined noncondensing diagram be laid out for a condensing engine using a high rate of expansion, the total number of expansions being reduced to that necessary to bring the final exhaust above the atmosphere, it will usually be found that more area has been added between the condensing and noncondensing expansion lines than has been subtracted between the two exhaust lines. Consequently, the area of the noncondensing card is larger than that of the condensing card, which means that, noncondensing, the engine is too large for its load. If the cut-off be shortened to reduce the area, the expansion line of the low-pressure cylinder will go below the atmosphere and form a loop. The situation is sometimes saved by the fact that the load has increased since the engine was installed, thus utilizing the increased area. Many engines are of course made to run both ways under the same load, but either the noncondensing condition is an emergency condition only—that is, operative, in case of need, but with no pretension to economy—or else the low-pressure cylinder is made too small for the best results condensing; that is, part of the economy condensing is sacrificed in order to save the waste due to the loop when running noncondensing. In the case of a Corliss engine the conditions are further complicated by the limitations of the valve gear. If the high-pressure cylinder has, as is probable, but one eccentric, and if the other conditions are favorable, it is more than likely that the noncondensing condition would require a cut-off on the high-pressure cylinder so late that it could not be reached by the valve gear. In any case the engine will be badly "out of balance" after the change; that is, the power will not be equally divided between the cylinders. We do not, however, attach as much importance to this as do many others.

The Peculiar Difficulties of the Molder.

The second and great reason for the slow advancement of the foundry is found in the peculiar characteristics of the business itself. There is nothing in the way of mechanical arts or mechanical sciences that requires more thought, more mechanical skill and more skillful practice. In all the other trades and professions there are rules, tables, gages and fixed and systematic order, that can be and are applied to the different requirements, and besides these a great amount of literature well and ably written, giving full and detailed instructions as to the quickest, safest and best method of accomplishing certain results. Tables on strengths, tables on pressure, tables on measurement and many others that are used are the result of ages of experience and practical tests. All these fall short when you come to apply them to molding, as that is learned almost entirely by the sense of feeling, a sense which cannot be transmitted to another, nor can it be transferred to paper. It is something that must be acquired by actual practice. The sense of touch plays such an important part in the construction of a mold, that without it it is impossible to construct a mold with any reasonable expectation for success.

The feeling of the sand for its proper temper, its adhesive qualities, and as to its porosity; then in ramming, the molder's sense of feeling should be trained to such a degree that he can tell at every stroke of the rammer whether he struck the bottom with sufficient force to ram the sand to stand the strain of the iron, or to prevent it from crumbling if dried, or to lift well in those parts which are to be raised off.

The material handled by the molder is of a very delicate nature, and is easy to disarrange through a very slight mistake in any way. Then again, the iron delivered to him is very frequently too dull to make clean, sound, perfect castings, and consequently his labor is all in vain.

If the clerk in the office in adding up a column of figures makes a mistake, it will show up in the trial balance for correction. If the patternmaker makes a mistake in a pattern, a little beeswax, putty, glue, a stick of wood with a jack-knife and chisel, will correct the mistake, as it is at all times apparent to the eye. The material from which the patterns are constructed are of a very solid nature and will not crumble away with the slightest touch of the hand. Many of the mistakes in the machine shop are overcome by fitting another piece to the one that has been spoiled, as in an error in measurement. In the foundry, a slight mistake or oversight will cause the entire day's, and sometimes the entire month's, work to go to the scrap pile. A mistake or oversight here cannot be seen in time to correct, consequently the molder is looked upon as careless and indifferent. He has probably made two molds from one pattern as near alike as possible; the casting from one will be a beautiful thing to look at, and the other will probably be a mis-shaped, ungainly candidate for the scrap pile.—JOHN G. SADLIER, at Buffalo meeting of the American Foundrymen's Association.

Personal.

Walter M. Wood, for several years with the Niles Tool Works Company at their New York branch, has resigned and accepted a position with Manning, Maxwell & Moore.

Frederick Brotherhood has been appointed manager of the foreign sales department of the Railway Supply Company with headquarters at their New York store, 106 Liberty street.

Obituary.

Ellis Dungan, a retired machinist, died in Philadelphia, July 22, seventy-two years old. He was for many years a foreman in the shops of Barton H. Jenks, at Bridesburg, Pa., afterwards incorporated as the Bridesburg Manufacturing Company.

"What is a stationary engineer?" "A man that runs an engine that stands still when it goes."—"Troy Times."

The City of Paris has appointed a special commission to study the means, processes and apparatus for suppressing the smoke nuisance.

"A barking dog won't bite. I know a barking dog won't bite, you know a barking dog won't bite; but the dog, he don't know it." The Brooklyn Bridge is safe. We all know the bridge is safe, some engineers assure us it is safe with all that can be crowded upon it; but it may be that the bridge does not know it.

The Lane & Bodley Company, Cincinnati, O., has sent out an announcement of its fiftieth anniversary. It began work by manufacturing a wall engine which one man could lift; to-day it builds the Twentieth Century heavy-duty Corliss engine, one of which is in operation in the Central Court basement of the Machinery Building at the Pan-American Exposition. The company is inclined to think that its loss by fire, within the last year, of all its patterns accumulated since the establishment of the business, has not been unfortunate, for it has occasioned the designing of an engine from the ground up without being hampered by old patterns and designs.

The French Chamber of Deputies has adopted a report of E. Astier looking to the organization, at the Conservatory of Arts and Trades, of a laboratory of mechanical, chemical and physical tests and of a national office for patents of invention and trade marks. It appears that this will effect the consolidation of the old repositories of patent models, descriptions, etc. At present the Conservatory authorized under a law of 1844 has the keeping of these models after the patents have run out, but during the period that the patents are in force the models are in the custody

of the Minister of Commerce. The storage of these in places some distance apart has occasioned much inconvenience to the public. The reorganized office would also assure the integral publication of patents on inventions.

The United States Government has now formally and finally given up the pneumatic dynamite gun, after spending over half a million dollars upon it. The expenditure was no doubt warranted at the time, but explosives have since been discovered which can safely be fired from high-power and long-range guns.

Miscellaneous Wants.

Advertisements will be inserted under this head at 25 cents a line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Gear Wheels, gear cutting. Grant ; see p.34.

Caliper cat. free. E. G. Smith, Columbia, Pa.

Punches & dies. Wal.M.Wks.,Waltham,Mass.

Wanted—Improvements in grinding machinery. Address Box 1435, Providence, R. I.

Light and fine mach'y to order ; models and elec. work specialty. E. O. Chase, Newark, N. J.

Book "Dies and Diemaking," $1, post paid. J.L.Lucas,Bridgeport,Ct. Send for index sheet.

"Brandt's Triple Expansion Gaskets" are the best for boilers. Randolph Brandt, 38 Cortlandt st., New York.

See 12 presses & dies for sheet-metals, S. E. cor. Machinery Hall, Buffalo Exposition. Ferracute Mch. Co., Bridgeton, N. J.

Wanted—To make your brass and aluminum castings, light or heavy ; write for prices. Casson & Middleton, 196-198 Liberty st., Paterson, N. J.

Light machinery plants, fully equipped for general fine work, can obtain considerable by arranging with high grade. "General Manager," care AMERICAN MACHINIST.

Machinery built by contract ; modern equipment and organization ; accurate work ; prompt delivery ; low prices ; weights up to 5 tons. The Blanchard Machine Co., Boston.

Gear and Milling cutters, adjustable reamers and special tools ; vertical millers, cutter and surface grinder and shears. Catalog of small tools free. R. M. Clough, Tolland, Conn.

Wanted—500-light, 16 C. P., 110-volt dynamo ; state whether new or second hand, belt or steam driven and all other necessary information. Box 322, AMERICAN MACHINIST.

Wanted—One good second-hand machine for tapping cast-iron flange unions, tees and ells up to 6 in ; state condition of machine and price. Bignall & Keeler Mfg. Co., Edwardsville, Ill.

Two hand-colored tempering charts (A and B), 36 steel-working receipts and free sample of Monarch Welding Compound, all for $1 ; these cover all difficult steel working ; invaluable to machinists. W. M. Toy, Sidney, Ohio (40 years a steel worker).

For Sale—A one-third or one-half interest in an old and well-established machinery business in a large Eastern city ; are doing a large business with increasing orders ; correspondence invited from parties interested. Address Box 287, AMERICAN MACHINIST.

Institutions retiring from business having machine tools, brass and wood working machinery will find it to their interest to correspond with us. We purchase complete plants or handle them on com. C. C. Wormer Mach. Co., 55-59 Woodbridge st., W., Detroit, Mich.

Capital to invest to manufacture or buy on up-to-date machine, any line, which will improve quality or increase quantity of product, and for which there is a steady demand ; correspondence solicited. To ensure notice give full particulars, in confidence, to "Domestic & Foreign," care AMER. MACHINIST.

Wants.

Situation and Help Advertisements only inserted under this head. Rate 25 cents a line for each insertion. About six words make a line. No advertisement under two lines accepted, and no advertisements abbreviated. The cash and copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded. Applicants may specify names to which their replies are not to be forwarded ; but replies will not be returned. If not forwarded they will be destroyed without notice. Original letters of recommendation or other papers of value should not be inclosed to unknown correspondents.

Situations Wanted.

By young man, in drafting room ; had shop practice. Box 324, AMERICAN MACHINIST.

Graduate of Lehigh desires a position as draftsman, M. E. ; shop practice. Box 323, AMERICAN MACHINIST.

Situation as foreman, by thorough, all-around machinist ; 22 years' experience, 10 as foreman ; references. Box 332, AM. MACH.

Mechanical engineer, 7 years' practical experience, desires responsible position ; reliable man ; best references. Box 335, AM. M.

Experienced draftsman ; last 5 years machine tools and fixtures ; first-class American and German references. Address Hols. Wienerst. 1, Berlin.

First-class mechanical draftsman, 31, reliable and industrious, is open for engagement ; mills located in New York and vicinity preferred. Box 325, AMERICAN MACHINIST.

Mechanical and structural draftsman, college graduate, 10 years' experience, first-class detailer, desires position with American concern in Mexico ; speaks Spanish. Box 333, AMERICAN MACHINIST.

Position as superintendent or general foreman ; am conversant with the machine business in all its branches, a designer of tools, jigs and modern appliances for economical production. Box 299, AMERICAN MACHINIST.

Foundry foreman, practical, up to date, progressive, 8 years' experience as foreman, good executive ability, first-class references, 37 years old, wants position ; salary from $25 to $30 per week. Address Box 337, A. M.

Mechanical engineer, Stevens graduate, 27 years old, desires position of responsibility at fair salary ; experience in steel construction, conveyor and elevator machinery and steam plants. Address Box 305, AMER. MACHINIST.

Superintendent, thoroughly practical, up to date, conversant with the machine business in all its branches ; best cost-keeping systems, shop management and discipline ; age 32 ; reference furnished. Box 306, AMER. MACH.

We can furnish names and records of competent men for positions as managers, superintendents and foremen in metal-working lines ; no charge. Address James Brady, 220 Broadway, New York (formerly of Brady Mfg. Co.).

Skilled designer and draftsman wants work ; has had experience on gun, sewing machine,

New Catalogs.

We have received from James L. Robertson & Sons, 204 Fulton street, New York, a catalog of steam specialties. The variety of appliances is great and ranges from hot water generators to planimeters. "Eureka" packing is an important item. This pamphlet is of standard size, 6x9 inches.

We have received from Hammacher, Schlemmer & Co., 209 Bowery, New York, a new catalog, No. 131, of files and rasps exclusively. The pamphlet contains 33 5¼x7½-inch pages, 11 of which are made up of hints and suggestions as to the proper method of using files. The firm deals with manufacturers and consumers directly, and not through the trade.

The Standard Tool Company, Cleveland, O., has published a new catalog of its line of twist drills, reamers, chucks, spring cotters, taps, flat spring and riveted keys and milling cutters. A twist drill grinder is also shown. The catalog embodies tables of useful information and of code words. It contains 223 pages and is of pocket size, 4½x7¼ inches.

The Adams Company, Dubuque, Ia., has sent us a catalog, No. 5, of molding machines. This shows the Farwell molding presses, Farwell universal molding machines, steel tubular sprue cutters, Adams snap flask, multiple molds, etc. The presses and machines are shown in various sizes and styles, many of them being portable, and there is much in the pamphlet to make it interesting to founders. It is standard size, 6x9 inches.

We have received, evidently from J. J. McCabe, New York agent, a handsome catalog of engine lathes built by the Bradford Machine Tool Company, Cincinnati, O. The pamphlet shows engine lathes of 14 to 31 inches swing over bed ; taper attachment ; double back geared engine lathes, 18 to 31 inches ; coarse screw cutting lathes, 16 to 25 inches ; 14 to 25-inch automatic power feed turret lathes ; turrets to fit 14 to 21-inch lathe carriages ; 31-inch shafting lathe, etc. Size of catalog, 6¾x9 inches.

New Corporations.

Empire Pneumatic Tool Co., of New York city ; capital, $10,000. Directors : J. W. Birkenstock and P. A. Gage, of New York city, and Lincoln Piercen, of Pelham.

Haeseler Puenmatic Tool Co. ; principal office, 109 Market street, Camden, N. J. ; capital, $200,000. Incorporators : Chas. H. Haeseler, Glenn P. Harris, John F. Joline.

Risdon-Alcott Turbine Co. ; principal office, Mount Holly, N. J. ; object, manufacture turbine water wheels ; capital, $125,000. Incorporators : Thomas J. Alcott, Edgar A. Alcott, Howard E. Alcott.

Hart Cycle & Automobile Company ; principal omice, Fifth and Federal streets, Camden, N. J. ; object, manufacturing bicycles ; capital, $50,000. Incorporators : J. G. Reeves, S. H. Avis and G. A. Hart.

Fred D. Johnson Co., of New York city ; to manufacture steam heating apparatus and machinery ; capital, $10,000. Directors : F. D. Johnson and W. L. Rushton, of New York city, and G. A. Pratt, of Brooklyn.

The National Bread Company has been incorporated in New Jersey ; capital, $3,000,000 ; object, manufacturing machinery for making bread. Incorporators : Joseph H. Strange, John J. Roach and Paul F. Lorder, all of Jersey City.

Commonwealth Steel Company ; principal office, Corporation Trust Company Building, 15 Exchange place, Jersey City, N. J. ; object, manufacturing iron and steel ; capital, $1,000,000. Incorporators : K. K. McLaren, C. W. Perkins and Louis B. Dailey.

Pittsburgh Fuel Saving Furnace Co. ; principal office, N. J. Corportion Guarantee & Trust Co. Building, 419 Market street, Camden, N. J. ; object, manufacturing furnaces ; capital, $25,000. Incorporators : Frank J. Hughes, Geo. M. Hughes, W. K. Brown.

The Auto Street Sweeper Co. ; principal office, Montgomery and Washington streets, Jersey City, N. J. ; object, manufacturing street sweeping machines ; capital, $100,000. Incorporators : George Pope, Roswell S. Nichols, John M. Scoble, Paul Walton, Lawrence C. Cherrill.

Manufacturers.

The Jackson (Mich.) Pulp Company's works have been burned.

B. H. S. Nash, of Cordele, Ga., proposes to locate a sawmill at Spring Hill, Fla.

The Florida Cotton Oil Company will build a factory in Honeymoon suburb, Jacksonville, Fla.

Harvey W. Stonebeck, sash manufacturer, etc., Quakertown, Pa., has made plans for a mill building.

An addition, 40x54 feet, is to be built to the mill of the Wisconsin Tissue Paper Company, Appleton, Wis.

The Richard Borden Manufacturing Company, Fall River, Mass., is contemplating the erection of a weave shed.